Sudan University of Science and Technology

College of Graduate studies

DESIGN AND IMPLEMENTATION OF A MODEL FOR VOICE ALARM UNIT FOR VEHICLES

تصميم وتنفيذ نموذج وحدة انذارصوتي للسيارات

Thesis submitted to the college of graduate studies in particle fulfillment of the requirement for the degree of Msc in mechatronics Engineering

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الايه

بسم الله الرحمن الرحيم

((وَاصْبِرْ نَفْسَكَ مَعَ الَّذِينَ يَدْعُونَ رَبَّهُمْ بِالْغَدَاةِ وَالْعَشِيِّ يُرِيدُونَ وَجْهَهُ ۖ وَلَا تَعْدُ عَيْنَاكَ عَنْهُمْ تُرِيدُ زِينَةَ الْحَيَاةِ الدُّنْيَا ۖ وَلَا تُطِعْ مَنْ أَغْفَلْنَا قَلْبَهُ عَنْ ذِكْرِنَا وَاتَّبَعَ هَوَاهُ وَكَانَ أَمْرُهُ فُرُطًا))

صدق الله العظيم

DEDICATION

I dedicate my dissertation work to my family and many friends. A special

feeling of gratitude to my loving parents, my father Dfallaa and my mother

Madeena

I also dedicate this dissertation to my many friends who have supported me

throughout the process.

 I will always appreciate all they have done,

I dedicate this work and give special thanks to Dr. Alkawad Ali Alfaki to supported

me and leading me to complete this work.

I dedicate this work for my brother Sief to supply me and especial dedicate to the

sweet side in my life my fiancee Aml.

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Abstract

The warning lights and indicators on the instrument cluster and center panel inform the driver the status of the vehicle's various systems. For the purpose of explanation, the researcher designed and implement the voice alarm unit for vehicles which get voice notification for the driver when the warning lamp lights on so as to explain the nature of the indicator and which Automobile system belong to it. The Designed voice alarm control unit   use microcontroller ,mp3 player, and TDA amplifier and connected concurrently with Automobile dashboard to receive signal and set the voice notification alarm according to indicator signal light on to inform the driver what is happened.the the microcontroller receive signal from the instrument cluster and do the selection process according to the indicator and give the selection to mp3 module through relays and after that the mp3 module fetch the desired voice alarm which recorded in memory which has clear information about the indicators, which sent through the vehicle speaker after amplifiering process through TDA2003 amplifier.

المستخلص

لمبات التحذير الموجودة في لوحة المؤشرات الموضوعه بطبلون القياده الغرض منها التنبيه لانظمة السيارة. تم تصميم وتصنيع وحدة تنبيه صوتي للسيارة في شكل رسائل صوتيه بغرض توضيح طبيعة لمبة التحذير واي من انظمة السيارة تخص هذه اللمبه, استخدم لتصميم وحدة التنبيه الصوتيه متحكمه دقيقه, مكبر صوتي, وجهاذ ام بي 3 موديول توصل وحدة التنبيه الصوتيه تزامناً مع لوحة المؤشرات لاستقبال الاشارة التحذيريه بالتوافق مع لوحة المؤشرات لتوضح للسائق طبيعة لمبات التحذير ، المتحكمه الدقيقه تستقبل الاشارة من لوحة المؤشرات فيقوم بعملية الاختيار وفقا للمبة الطبلون ويتم الاختيار عن طريق مشغل الام بي 3موديول الذي يقوم بجلب المنبه الصوتي المطلوب الذي يحوية المعلومة الصوتية الواضحة التي تخص النظام ويتم تكبير المنبه الي سماعات السيارة عن طريق المكبر الصوتي .

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List of abbreviation

ABS	Anti lock Brake System
DSP	Digital Signal Process
ECU	Engine Control Unit
EPS	Electronic Power Steering
ESP	Electronic Stability Brake
HCS	Havac Control System
PCM	Power trainer Module
SRS	Supplemental Restraint System
4WD	Four Wheel Drive

CHAPTER ONE
INTRODUCTION

CHAPTER ONE : INTRODUCTION

1.1. preface:

The automation systems has become controlling all fields and specially in vehicles industry, which compose a lot of systems like engine control unit (ECU) which control the engine performance, anti lock brake system (ABS) which control the brake performance, stability control system for stability vehicle(ESP), electronic power steering(EPS), supplemental restraint system (SRS) which control the performance of air bag system, automatic transmission module (PCM) to control the system of transaxel motion, havac control system (HCS), suspension system, smart power distribution, and other control systems. The companies raise the score of competitions by making more controller systems options for customers' convenience to get more profits. The complexity of vehicle electronics has significantly increased during the last 20 years. A large number of new functionalities require a significant amount of status information to be displayed to the driver. This information is typically provided via the cluster panel by means of simple LEDs, a segment LCD or even dot matrix LCD displays, More controller system means more alarms on instrument panel which complicate the process for the simple driver to understanding the situation of the vehicle specifically in failure position. This research is concern with alarms of the automation systems on dash bord in the vehicls and how explain this light alarm for driver vehicle. Design model to inform the driver directly and phonetic concurrently with the instrument panel what is this indicator light and which one system belong it is the goal of research.

1.2 Problem Statement:

 Many of automation systems in cars, and many of alarms on instrument panel form problem to understand it, specifically for the simple peoples with weak technology touch. The ignorance of light alarm for the system it may caused system failure, for example in engine control unit (ECU) when the check engine comes on it is very important to check the system and know the kind of troube code .Some of codes can affect in engine performance and some of them can stopped the engine .

So knowing and distinguishing the light alarm in instrument panel very important , that can help the owner vehicle to saving the car.

The problem of research focus on some of drivers not understanding the indicator LEDS on instrument panel when it's lighting on for some trouble.
This research can help to solve this problem by design voice alarm unit which can transfer the visual alarm to voice massage alarm for more explanation to the nature of the alarm which comes on for something wrong that happened on the system.

1.3 Objectives of the project:

The objectives of the research are:

1. To design voice alarm unit .

2. To implementat voice alarm unit

3. To connect the voice alarm unit with instrument panel simultaneously to take care

explanation what did means this indicator when its light on

4. To inform the driver what nature of the trouble and the range of seriousness
 for the indicate led.

1.4 Scope:

The voice alarm unit will be designed and injoined to monitoring alarm of automation systems of the vehicls.

1.5 Methodology:

 1. Design the voice alarm unit module we can use microcontroller ATMEGA family to receive the signal from automatic systems concurrently with instrument panel.

2. Implement system by connect microcontroller with 12V regulator and MP3 module to store alarms on memory and use TDA2003 Amplifier to amplify the signal of alarm when take place

3. Test the system by connected with the dashboard of vehicle to receive the signal of alarm concurrently and select the alarm voice accordine to the signal and amplify this voice for vehicle speaker to clear and understandable voice using recorder module that driver can understanding it.

CHPTER TWO

LITERATURE REVIEW AND PREVIOUS STUDIES

CHAPTER TWO: LITERATURE REVIEW AND PREVIOUS STUDIES

2.1 Voice Alarm System?

There is some well documented research [1] into the human behavior in the event of fire. Most striking is the variation in the response to alarm signals:

- 13% people react in timely manner to bells
- 45% of people react to text information
- 75% of people react in timely manner to text voice

Further research shows that people behavior various dependant on the environment, and in an emergency may exit the building using the same door they used to enter, the use of a clear voice message greatly increase response time and provides opportunity occupants of safest emergency rout Figure (1-1-2).[2]

Figure (1-1-1)the human Response for alarm
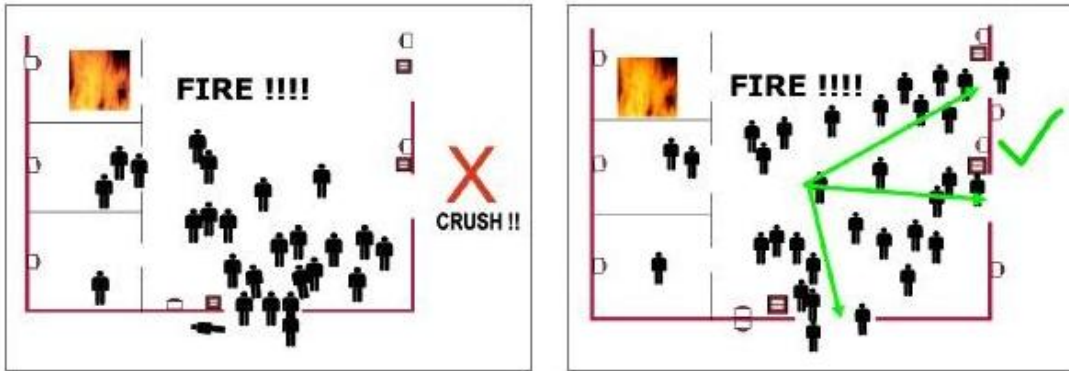
Figure (1-1-2) occupants unresponsive for bell and response for voice message

In other Studies have shown [2] that humans are more responsive to emergency voice systems than to conventional evacuation bells and that less than 15% of the population will react appropriately to a fire alarm signal alone, a fraction that increases to 70% for voice messages. Research conducted at the University of Surrey showed that 45% of occupants could distinguish between a fire alarm and other types of alarms. Furthermore, when a fire alarm bell sounded, 74% of the occupants assumed the alarm was a drill.

That is means the voice text or talking alarm more efficient than other alerts which can reach the information of the dinger and seriousness' quickly and increase the factor of human response to alarm. [2]

2.2 Speech intelligibility

Speech intelligibility is the degree to which humans can understand a spoken message [3]. It is becoming an increasing concern in emergency voice alarm communication systems, due to the critical information that it conveys to building occupants. If the occupants are unable to understand the emergency information they are being given, they cannot react appropriately, which could lead to injury or death. [3]

Speech is defined by Merriam-Webster dictionary as the expression of thoughts through spoken words. Speech is comprised of phonemes, which is the smallest

phonetic unit of a language. It is a continuous waveform, which has a fundamental frequency between 100 and 400 Hz. [4]

Generally the voice alarm systems its very important in our life, and used in many type of systems, for example home security to save our family in safe, fire fighting system, in factory operation, machines ,and automotives. However recently a lot of research and inventions are don in alarm system.

In fire fighting system the alarm system is the main component in the system A key aspect of fire protection is to identify a developing fire emergency in a timely manner, and to alert the building's occupants and fire emergency organizations. This is the role of fire detection and alarm systems. Depending on the anticipated fire scenario, building and use type, number and type of occupants and criticality of contents and mission, these systems can provide several main functions:

First, they provide a means to identify a developing fire through either manual or automatic methods.

Second, they alert building occupants to a fire condition and the need to evacuate. Another common function is the transmission of an alarm notification signal to the fire department or other emergency response organization.

Initiating device circuits, notification appliance circuits, and signaling line circuits shall be permitted to be designated as either Class A or Class B, depending on their performance during no simultaneous single circuit fault conditions . [5]
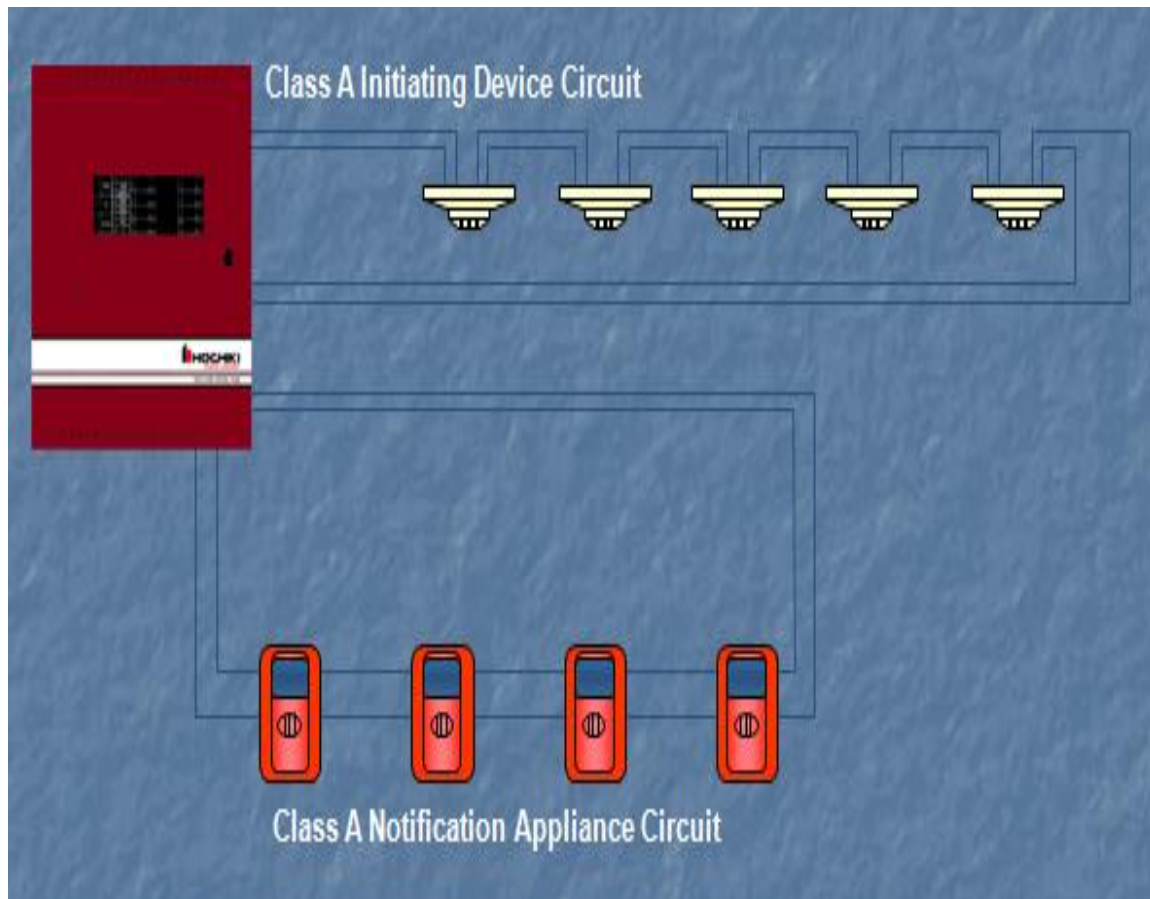
Figure (2-2) fire alarm system

2.3 Instrument Cluster :

The warning lights and indicators on the instrument cluster and center panels inform the driver of the status of the vehicles various systems. For the purpose of explanation, the following illustration Figure (2-4) displays all warning lights and indicators illuminated for Lexus vehicle.[6]

Figure (2-4) Lexus Instrument Cluster

2.3.1 Warning lights :

Warning lights inform the driver of malfunctions in the indicated vehicle Systems. In most conditions there are three modes for warning light actions:-

1- These lights turn on when the engine switch is turned to IGNITION ON mode to indicate that a system check is being performed. They will turn off after the engine is on, or after a few seconds. There may be a malfunction in a system if the lights do not come on, or turn off. Have the vehicle inspected by the dealer.[6]

2- The light flashes to indicate that the system is operating.

3- The light comes on when the system is turned off, the light flashes faster than Usual to indicate that the system is operating.

2.3.2 Some Warning Symbol:

The warning light is very important to indicate any of emergency status for the system in the figure (2-5) shown some symbol of warning light.[6]

More information about instrument cluster and warning light in appendix.

The image shows a dashboard instrument cluster with numbered warning lights (1-64) and a legend table:
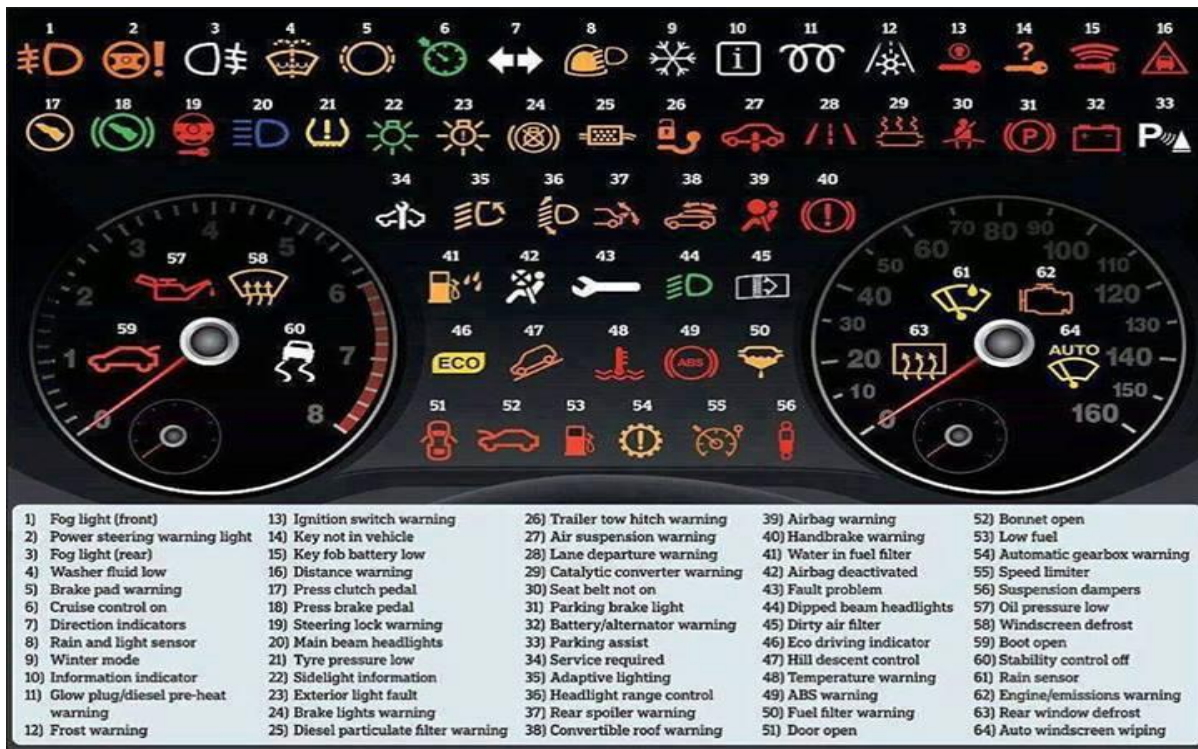
1) Fog light (front)	13) Ignition switch warning	26) Trailer tow hitch warning
2) Power steering warning light	14) Key not in vehicle	27) Air suspension warning
3) Fog light (rear)	15) Key fob battery low	28) Lane departure warning
4) Washer fluid low	16) Distance warning	29) Catalytic converter warning
5) Brake pad warning	17) Press clutch pedal	30) Seat belt not on
6) Cruise control on	18) Press brake pedal	31) Parking brake light
7) Direction indicators	19) Steering lock warning	32) Battery/alternator warning
8) Rain and light sensor	20) Main beam headlights	33) Parking assist
9) Winter mode	21) Tyre pressure low	34) Service required
10) Information indicator	22) Sidelight information	35) Adaptive lighting
11) Glow plug/diesel pre-heat warning	23) Exterior light fault	36) Headlight range control
12) Frost warning	24) Brake lights warning	37) Rear spoiler warning
	25) Diesel particulate filter warning	38) Convertible roof warning

39) Airbag warning	52) Bonnet open
40) Handbrake warning	53) Low fuel
41) Water in fuel filter	54) Automatic gearbox warning
42) Airbag deactivated	55) Speed limiter
43) Fault problem	56) Suspension dampers
44) Dipped beam headlights	57) Oil pressure low
45) Dirty air filter	58) Windscreen defrost
46) Eco driving indicator	59) Boot open
47) Hill descent control	60) Stability control off
48) Temperature warning	61) Rain sensor
49) ABS warning	62) Engine/emissions warning
50) Fuel filter warning	63) Rear window defrost
51) Door open	64) Auto windscreen wiping

Figure (2-5) some warning light for vehicles

2.3.3 Engine Malfunction Light:

The chick engine light it's so important warning indicator in the dashboard because informing us that the engine control unit have a trouble code or malfunction condition so it's necessary to response for the indicate and do quick scan to know what the problem and degree of seriousness of the condition, and try to fix the problem and reset the indicator light.

In many cases of the careless or unawareness for the check light can cause engine to stop which can caused problems for the owners the vehicles.

The engine control unit controls directly the engine of the vehicle the performance of the engine and control all of the automation systems in the car,

Figure(2-6-1) and Figure(2-6-2) shows the emission control for Hyundai accent gasoline vehicle, and Figure(2-7) shows the control system for Toyota land cruiser Diesel (common rail system).[6]
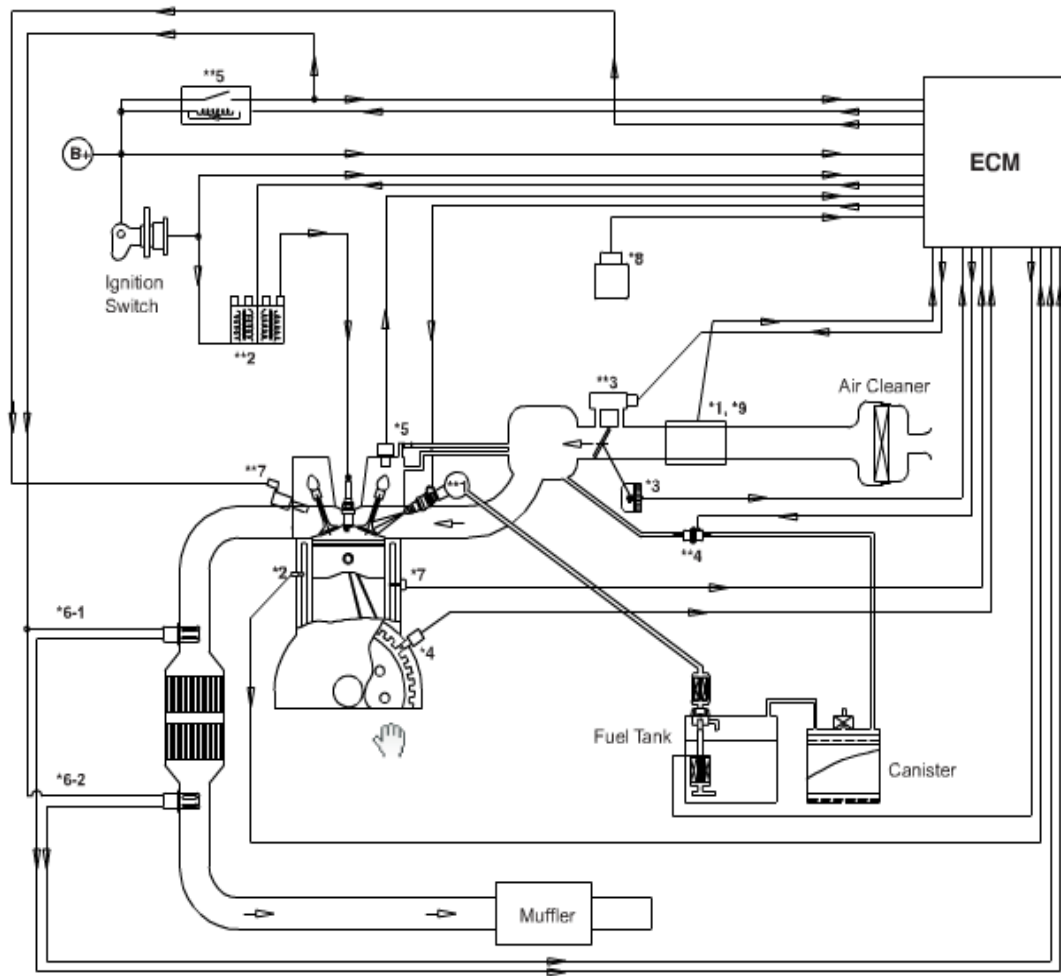

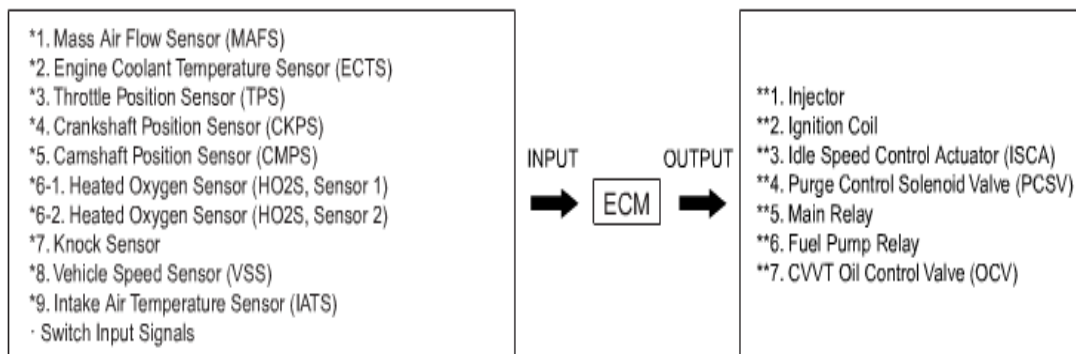**Figure (2-6-1) emission control system**

*1. Mass Air Flow Sensor (MAFS)
*2. Engine Coolant Temperature Sensor (ECTS)
*3. Throttle Position Sensor (TPS)
*4. Crankshaft Position Sensor (CKPS)
*5. Camshaft Position Sensor (CMPS)
*6-1. Heated Oxygen Sensor (HO2S, Sensor 1)
*6-2. Heated Oxygen Sensor (HO2S, Sensor 2)
*7. Knock Sensor
*8. Vehicle Speed Sensor (VSS)
*9. Intake Air Temperature Sensor (IATS)
· Switch Input Signals

INPUT → ECM → OUTPUT

**1. Injector
**2. Ignition Coil
**3. Idle Speed Control Actuator (ISCA)
**4. Purge Control Solenoid Valve (PCSV)
**5. Main Relay
**6. Fuel Pump Relay
**7. CVVT Oil Control Valve (OCV)
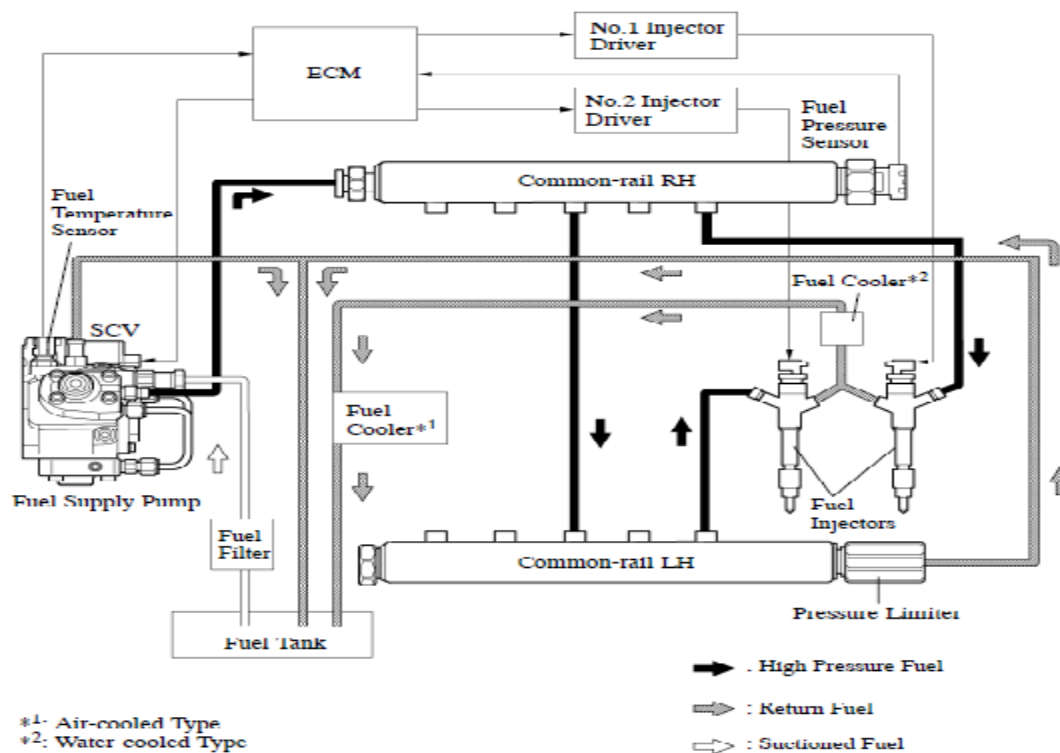
Figure (2-6-2) schematic diagram

Figure (2-7) engine control system for Diesel

2.3.4 Gauge and Meters :

The Figure (2-8) display the gauges on instrument cluster.[6]

The units used on the speedometer may differ depending on the target region.

Figure (2-8)The gauge on instrument cluster

1\ **Engine Coolant Temperature gauge**

Displays the engine coolant temperature The engine may be overheating if the engine coolant temperature gauge is in the red zone ("H"). In this case, immediately stop the vehicle in a safe place, and check the engine after it has cooled completely.

2\ **Tachometer**

Displays the engine speed in revolutions per minute. Do not let the indicator needle of the tachometer enter the red zone, which indicates the maximum engine speed.

3\ **ECO lamp and SPORT lamp**

Changes colors according to driving mode

4\ **Multi-Information Display**

Presents the driver with a variety of driving-related data

5**Speedometer**

Displays the vehicle speed

6**Fuel gauge**

Displays the quantity of fuel remaining in the tank

7**Shift position and shift range**

Displays the selected shift position or selected shift range

8**Odometer and trip meter display**

Displays the total distance the vehicle has been driven

2.3.5 Multi-Information Display:

The multi-information display has three areas depending on the display Mode for example in new Land Cruiser (Station Wagon) in Figure (2-9), the three mode display is shown in the Figure (2-10)
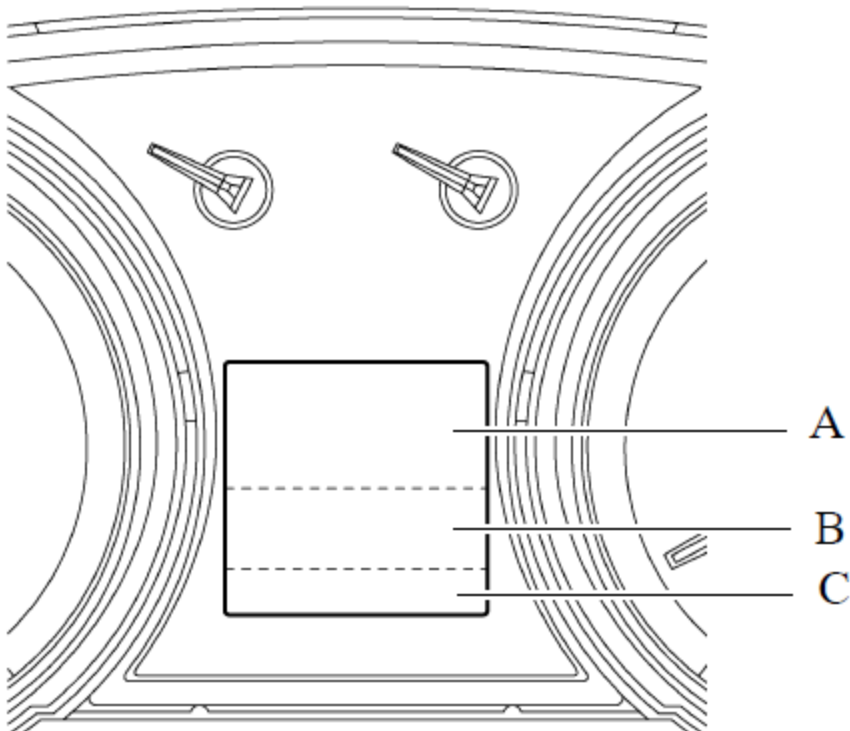

Figure (2-9) Multi-information Display

Figure (2-10) Display Areas

Displayed Information:

The multi-display modes can illustrate in the below Table (2-1) which divide it to three area A, B, and C.

Table (2-1) multi-display modes

Display Areas	Mode	Outline
A	Cruise Information	- instant fuel consumption, average fuel consumption after refueling, average speed since engine start, distance driven since engine start. - The display can be switched by using the DISP switch.

		Interrupts the multi-information display immediately when a warning occurs.
	Warning	
A	Clearance Sonar	Displays the location of an obstacle and the approximate distance between the vehicle and the obstacle.
	Diagnosis	DTC (Diagnostic Trouble Code) for the brake control system (TRAC and VSC function), tire pressure warning system and VGRS can be displayed.
B	Shift Position	Displays the current shift position.
	Active Height Control Suspension	Displays the currently selected vehicle height.
C	ODO/TRIP	Switches the display of the ODO/TRIP and displays the ODO/TRIP.

CHAPTER THREE

Description Component

CHAPTER THREE : Description Component

3.1 Conceptual Designs

To achieve the Voice Alarm Unit module we can use Microcontroller ATMEGA family to receive the signal from automatic systems concurrently with instrument panel, and Amplifier this signal to clear and understandable voice using recorder module that driver can understand it the Figure (3-1) shows the block diagram of Voice Alarm Unit.
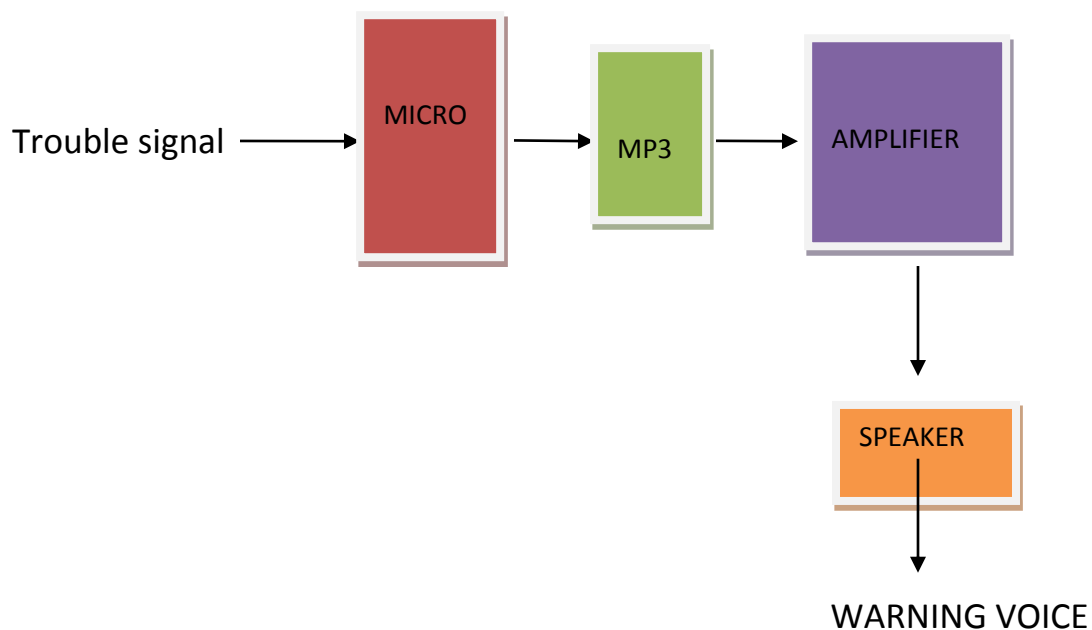
Trouble signal ⟶ MICRO ⟶ MP3 ⟶ AMPLIFIER ⟶ SPEAKER ⟶ WARNING VOICE

Figure (3-1) The Block Diagram of Voice Alarm Unit operates.

When trouble in the system take place the warning lamp on instrument panel comes light on and simultaneously trouble signal send to Voice Alarm Unit which enter to the microcontroller ATMEGA 16

And the micro select the voice from the MP3 device which belong to the warning light who can explain which system belong this light and get clear inform about it, and amplifier this signal to the car speaker to be audible voice for the driver to take desired procedures.

3.2 Component of Voice Alarm Unit

To implement the Voice Alarm Unit component desired is:

Microcontroller atmega16, Uln2803 drive chip, Relays, Mp3 player module, TDA2003 Amplifier, Speaker.

3.2.1 Microcontroller Atmega16:

- Four 8-bit ports designated as PORTA, PORTB, PORTC and PORTD.

- ATmega16 is an 8-bit high performance microcontroller of Atmel's Mega AVR family with low power consumption. Atmega16 is based on enhanced RISC (Reduced Instruction Set Computing). Most of the instructions execute in one machine cycle. Atmega16 can work on a maximum frequency of 16MHz.

- ATmega16 has 16 KB programmable flash memory, static RAM of 1 KB and EEPROM of 512 Bytes.

- ATmega16 is a 40 pin microcontroller. There are 32 I/O (input/output) lines which are divided into in-built peripherals like USART, ADC, Analog Comparator, SPI, JTAG etc. Each I/O pin has an alternative task related to in-built peripherals. [7]

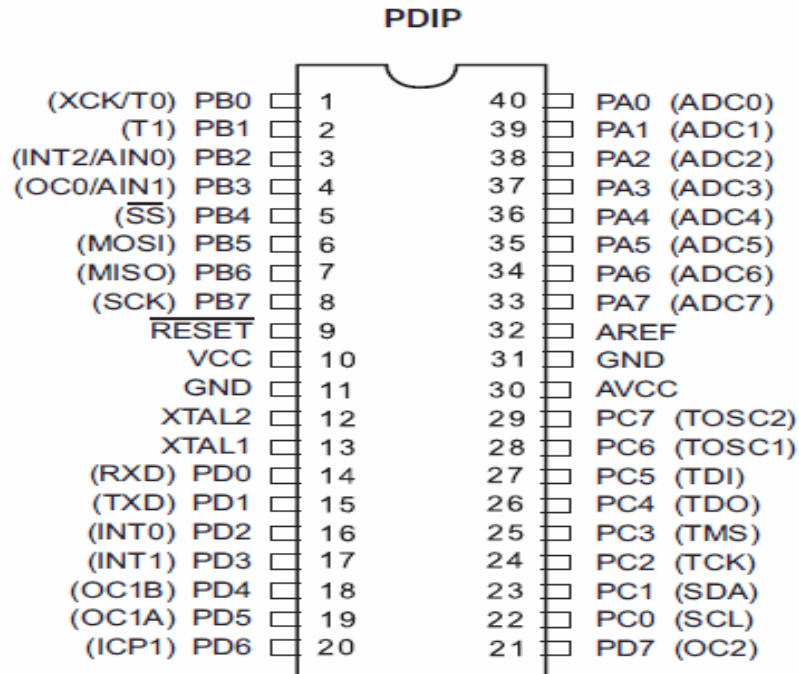 The Figure (3-2) show pin configuration of Microcontroller

```
                          PDIP
      (XCK/T0)  PB0  ▭  1        40  ▭  PA0  (ADC0)
         (T1)   PB1  ▭  2        39  ▭  PA1  (ADC1)
    (INT2/AIN0) PB2  ▭  3        38  ▭  PA2  (ADC2)
    (OC0/AIN1)  PB3  ▭  4        37  ▭  PA3  (ADC3)
         (SS)   PB4  ▭  5        36  ▭  PA4  (ADC4)
       (MOSI)   PB5  ▭  6        35  ▭  PA5  (ADC5)
       (MISO)   PB6  ▭  7        34  ▭  PA6  (ADC6)
        (SCK)   PB7  ▭  8        33  ▭  PA7  (ADC7)
               RESET ▭  9        32  ▭  AREF
                 VCC ▭  10       31  ▭  GND
                 GND ▭  11       30  ▭  AVCC
               XTAL2 ▭  12       29  ▭  PC7  (TOSC2)
               XTAL1 ▭  13       28  ▭  PC6  (TOSC1)
        (RXD)   PD0  ▭  14       27  ▭  PC5  (TDI)
        (TXD)   PD1  ▭  15       26  ▭  PC4  (TDO)
       (INT0)   PD2  ▭  16       25  ▭  PC3  (TMS)
       (INT1)   PD3  ▭  17       24  ▭  PC2  (TCK)
       (OC1B)   PD4  ▭  18       23  ▭  PC1  (SDA)
       (OC1A)   PD5  ▭  19       22  ▭  PC0  (SCL)
       (ICP1)   PD6  ▭  20       21  ▭  PD7  (OC2)
```

Figure (3-2) Pin Configuration of Microcontroller

3.2.2 Uln2803 drive chip:

The eight NPN Darlington connected transistors in this family of arrays are ideally suited for interfacing between low logic level digital circuitry (such as TTL, CMOS or PMOS/NMOS) and the higher current/voltage requirements of lamps, relays, printer hammers or other similar loads for a broad range of computer, industrial, and consumer applications. All device feature open–collector outputs and freewheeling clamp diodes for transient suppression. The ULN2803 is designed to be compatible with standard TTL families, the Figure (3-3) shown the pin connectors for uln2803.
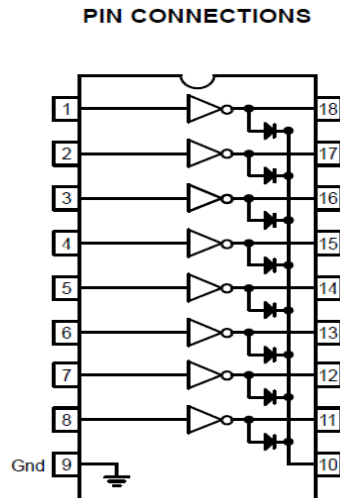
Figure (3-3) uln2803 Driver pin connection

3.2.3 Relays

A relay is an electrically operated switch. Many relays use an electromagnet to operate a switching mechanism mechanically, but other operating principles are also used. Relays are used where it is necessary to control a circuit by a low-power signal (with complete electrical isolation between control and controlled circuits), or where several circuits must be controlled by one signal , the Figure(3-4) shown relay diagram

Figure (3-4) The Relay and Pin Diagram

3.2.4 TDA2003 Amplifier:

DESCRIPTION

The TDA 2003 has improved performance chip. The features of TDA 2003, very low number of external components, ease assembly, Space and cost saving, are maintained. The device provides a high output current capability (up to 3.5A) very low harmonic and cross-over distortion. Completely safe operation is guaranteed due to protection against DC and AC short circuit between all pins and ground, thermal over-range, load dump voltage surge up to 40V and fortuitous open ground, Figure (3-5) show the TDA2003 Amplifier.[8]

The diagram of TDA2003 connected as audio amplifier illustrated in appendix.
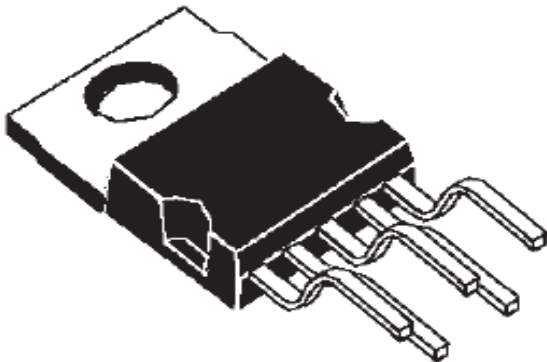
Figure (3-5) TDA2003 Amplifier

3.2.5 Mp3 player module:

The MP3 player is the convergence of many technologies. Alone, none of its components are revolutionary, but together they create an unprecedented consumer product.

Specific components may vary, but here are the basic parts of a typical MP3 player:

- Memory, Microprocessor, Digital signal processor (DSP) , Display , Playback controls , Audio port , and Amplifier .
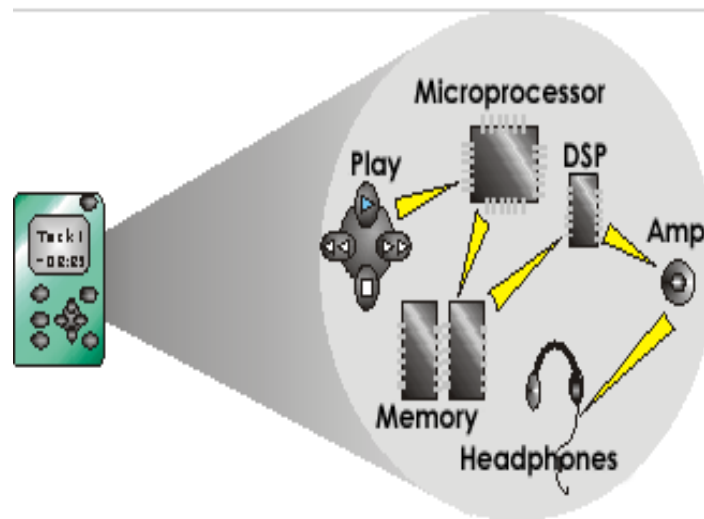
Figure (3-6) MP3 component

With the exception of the last one, these are all types of solid-state memory. The advantage to solid-state memory is that there are no moving parts, which means better reliability and no skips in the music. MP3 players that contain tiny hard disk drives can store 10 to 150 times more than Flash memory devices can.

The microprocessor is the brains of the player. It monitors user input through the playback controls, displays information about the current song on the LCD panel and sends directions to the DSP chip that tells it exactly how to process the audio.[9]

In addition to storing music, the MP3 player must play music and allow the user to hear the songs played. To do this:

- Pulls the song from its memory.
- Decompresses the MP3 encoding, through DPS, via an algorithm or formula.
- Runs the decompressed bytes through a digital-to-analog converter into sound waves.
- Amplifies the analog signal, allowing the song to be heard

CHAPTER FOUR

Implement The voice alarm

CHAPTER FOUR: Implement The voice alarm

4.1 Electrical circuit Simulation:

As mentioned before that we can use microcontroller ATMEGA family to receive the signal from automatic systems concurrently with instrument panel, and Amplify this signal to get clear and understandable voice using recorder module that driver can understand it the figure(4-1) and figure (4-2) shown the circuit diagram of voice alarm unit and the component of the unit, and figure (4-3) illustrate the implement design of voice alarm control unit .
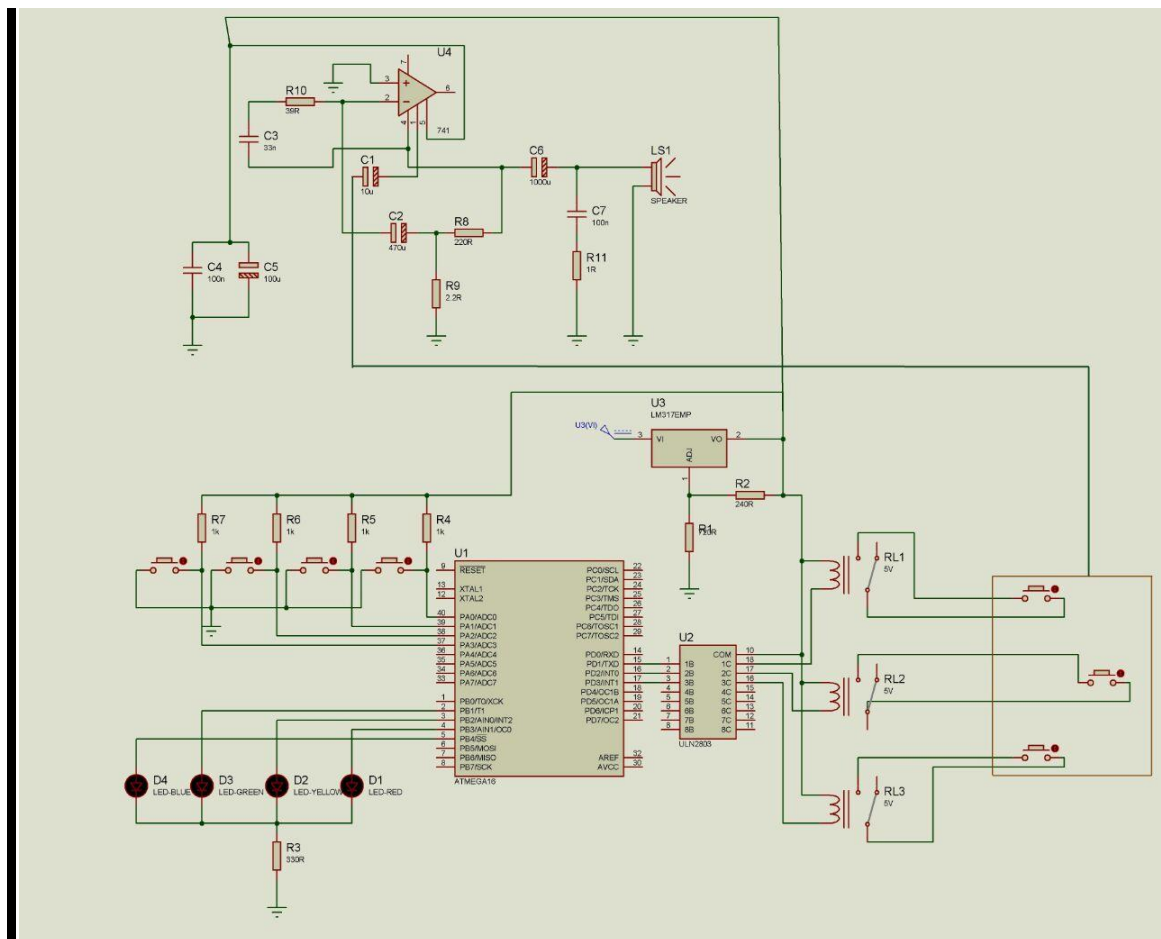
Figure (4-1) The Circuit Diagram of Voice Alarm Unit
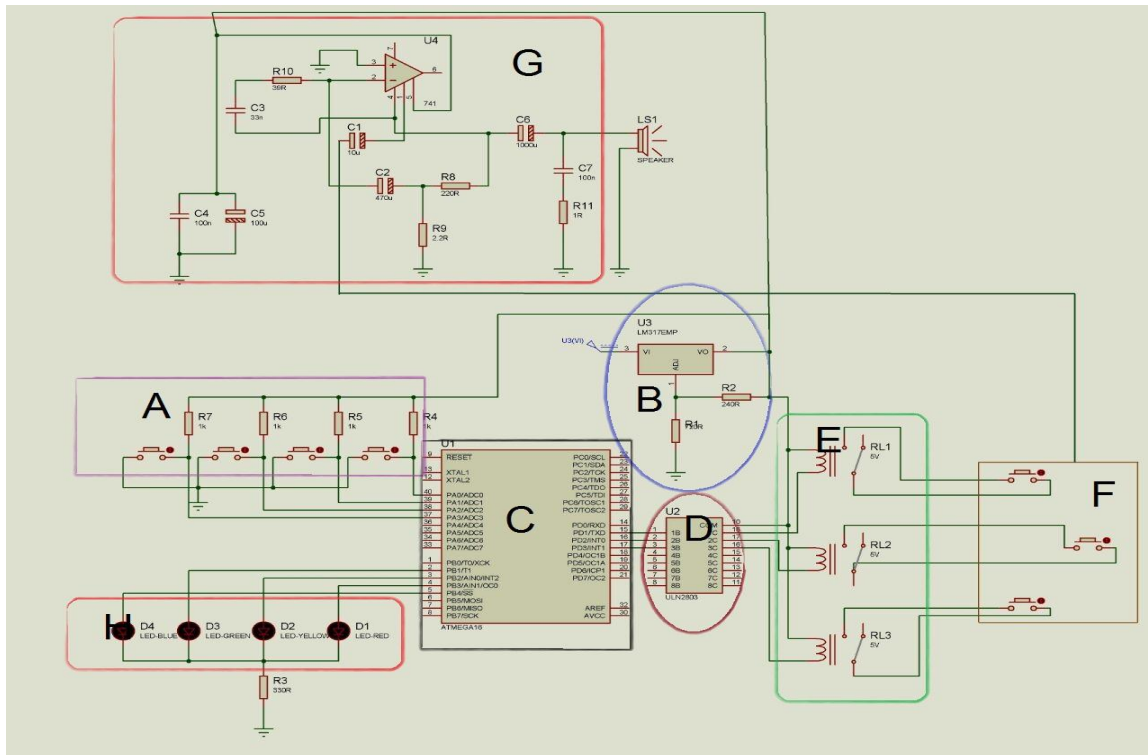
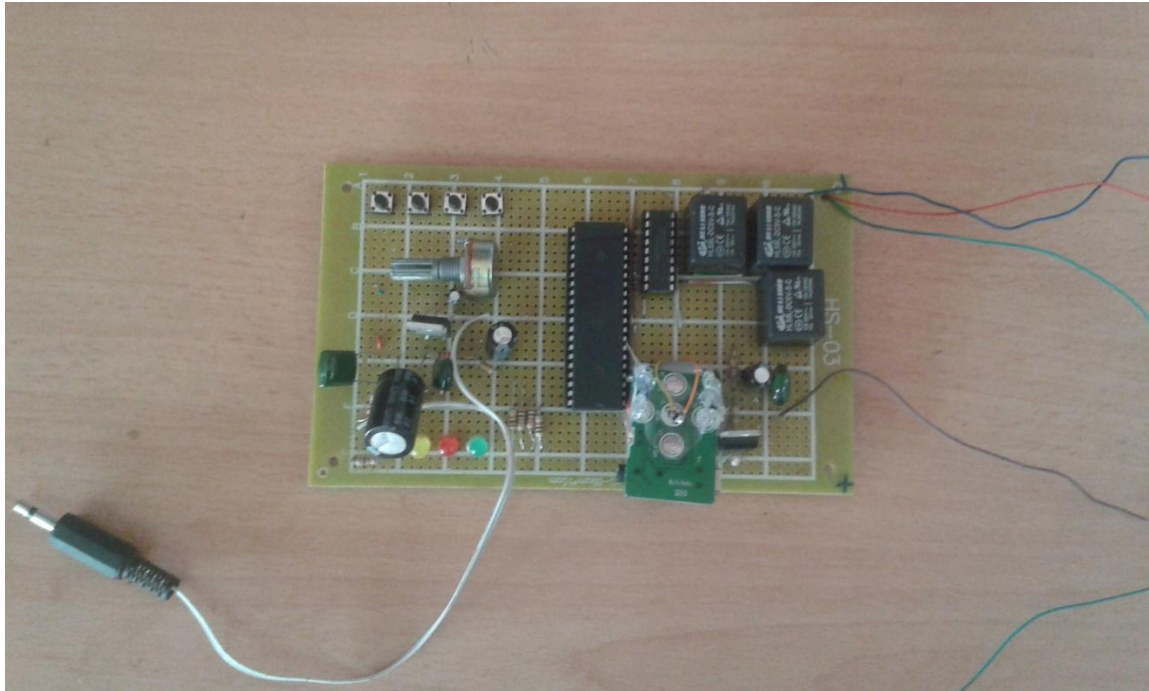**Figure (4-2) Component Of The Circuit Diagram Of Voice Alarm Unit**
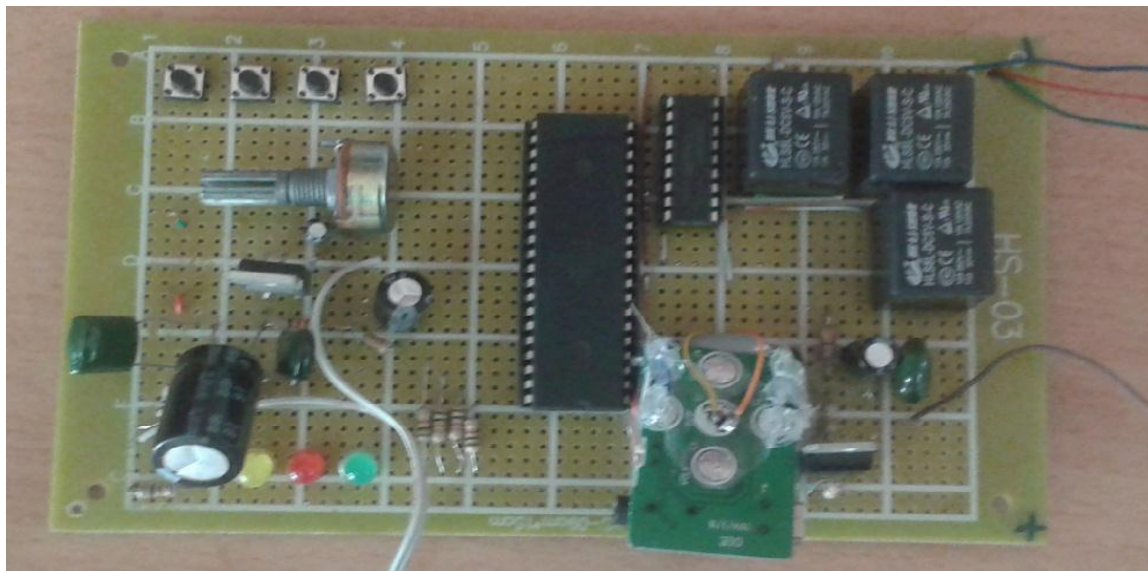
Figure (4-3-1) Implement the Circuit of Voice Alarm Unit

Figure(4-3-2) Implement The Circuit Of Voice Alarm Unit

4.1.1 Partition A switches

Partition **A** show the switches the researcher use switches to explain the nature of signal that microcontroller received which can receive drain signal or ground signal or 5 VOLT signal, that can depend on the type operation of instrument panel the Figure(4-4) shows the switches on the circuit.
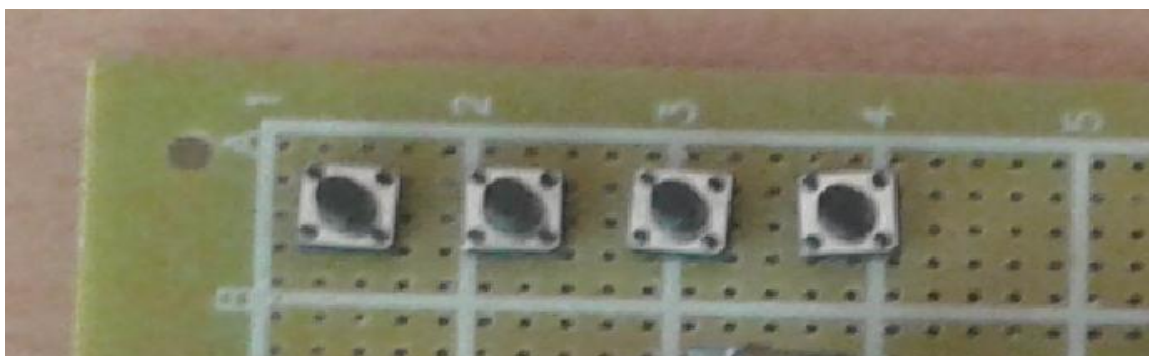

Figure (4-4) the Switches

4.1.2 Partition B power circuit

Partition **B** shows the power circuit researcher use LM317 voltage regulate that is integrated circuit is an adjustable 3 terminal positive voltage regulator designed to supply more than 1.5 A of load current with an output voltage adjustable over a 1.2V to 37V range. It employs internal current limiting, thermal shutdown, and safe area compensation the Figure (4-5) shows the power circuit in the circuit diagram.

Figure (4-5) The Power Circuit

4.1.3 Partition C microcontroller

Partition **C** shows the microcontroller ATMEGA 16 which control the selection of alarm voice according to the received alert signal of system, the selection of voice

alarm is take place by controlling the relays signal up and down whatever the selection need to fetch the voice from the external memory which is installed to the mp3 module, the Figure (4-6) shows the microcontroller in the circuit diagram.

Figure (4-6) Atmega16 Microcontroller

4.1.4 Partition D uln2803

Partition **D** shows the   eight NPN Darlington ULN2803 driver which used to amplify the processing signal of microcontroller, the connected transistors in this family of arrays are ideally suited for interfacing between low logic level digital circuit and the higher current voltage requirements of relays, the Figure(4-7) shows the ULN2803 in the circuit diagram.
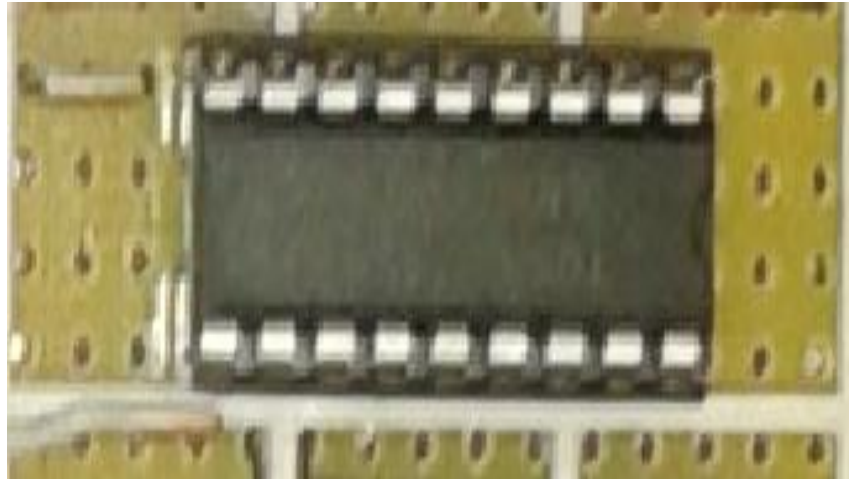
Figure(4-7) Show The ULN2803 Driver

4.1.5 Partition E Relays

Partition **E** show the relays which used to select the voice alarm according to signal control of microcontroller, to select the voice alarm from memory the relay upper or down the drain of mp3 control to fetch the suitable voicealarm, the Figure(4-8) shows the relays on the circuit diagram.

Figure(4-8) the Relays

4.1.6 Partition F Mp3 module

Partition **F** shows the MP3 module which used to Pulls the voice alarm from the memory according to the select of the microcontroller simultaneously with the signal of the warning light in the dash board, the Figure(4-9) shows the MP3 module in the circuit diagram.

Figure(4-9) The MP3 Module

4.1.6 Partition G TDA2003

Partition **G** shows the TDA2003 amplifier circuit diagram which use to amplify the sound of alarm after fetched from memory in MP3 module, which make the voice alarm audible by the speakers of the vehicle, the Figure(4-10) shows the TDA2003 in the circuit daiagram.

Figure (4-9) the TDA2003 Amplifier

4.1.7 Partition H LEDS

Partition **H** shows the LEDS,The researcher use this LEDS to explain The nature of the warning light on dash board as sample, we take four LEDS for four samples ,green,red,yellow,and white for, engine control unit, anti lock brake system, air bag, and electronic power steering, the Figure(4-11) shows the LEDS in circuit diagram.

Figure (4-10) The LEDS in circuit diagram

4.2 The Voice Alarm Unit Operation:

When trouble in the system take place the warning lamp in the dash board light on and concurrently trouble signal send to the voice alarm unit which enter to the microcontroller. In this module the researcher take the trouble signal as ground inter to the microcontroller,and the micro select the voice from the MP3 module. The MP3 module Pulls the voice sound from the memory, Decompresses the MP3 encoding, through DPS, via an algorithm or formula, Runs the decompressed bytes through a digital-to-analog converter into sound waves, And Amplifies the analog signal, allowing the voice to be heard, which belong to the warning light who can explain which system belong this light and get clear inform about it, and amplifier this signal to the car speaker to be audible voice for the driver to take desired procedures, use Bascomp language to make software to the unit which operate properly as design objects more information in appendix.
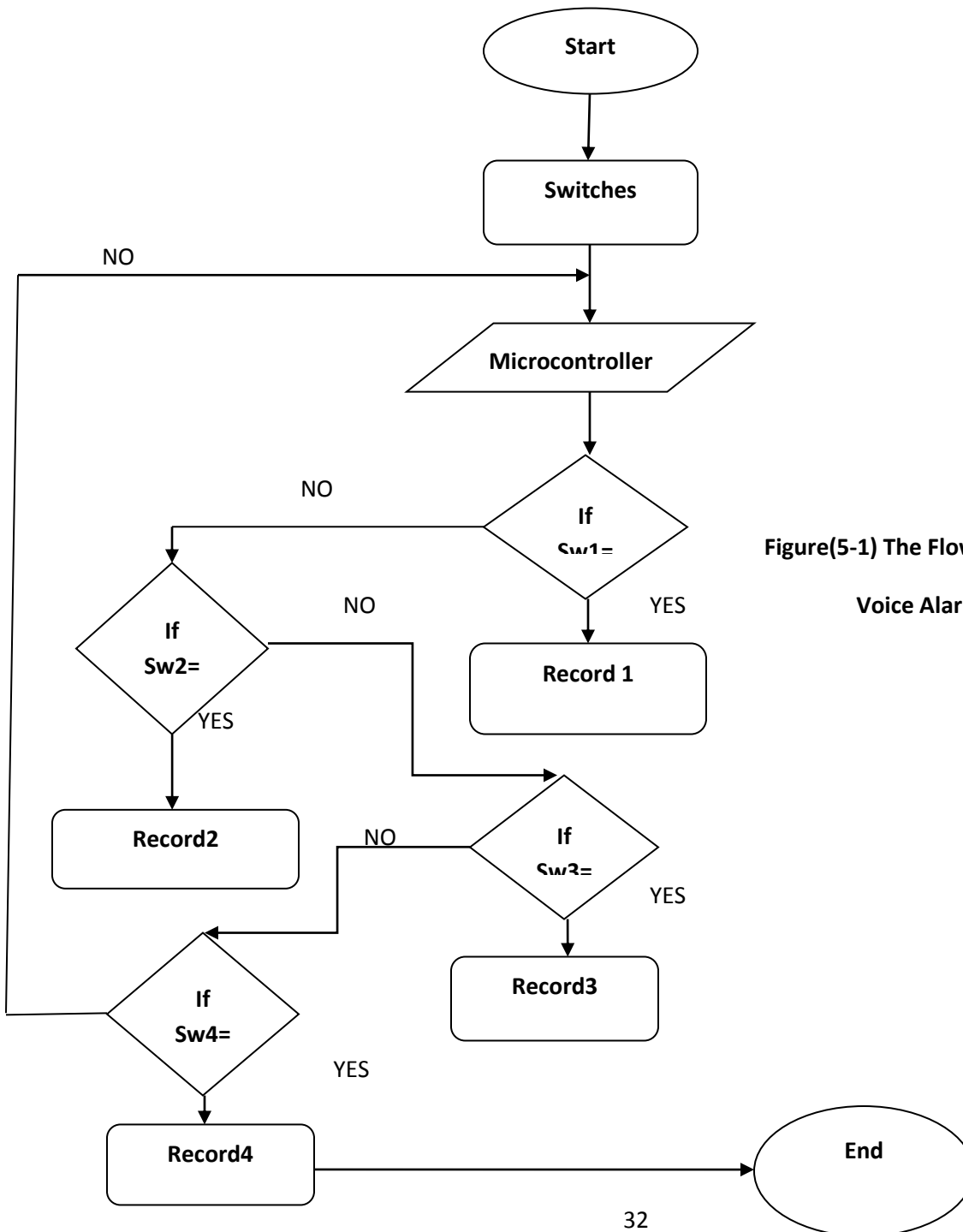
CHAPTER FIVE

TESTING AND RESULTS DISCUSSION

CHAPTER FIVE : TESTING AND RESULTS DISCUSSION

5-1 Flow chart of VACU:

The figure(5-1) shows the flow chart of voice alarm control unit which start the vacu and read the condition of switches sequentially and select alarm according to achieved condition.

Figure(5-1) The Flow chart of

Voice Alarm Unit

The voice alarm unit start to read the first state of switches and that when the vehicle at switch on position without engine run and after start engine the microcontroller start to read the state of switches sequentially from first switch to the last switch and when any switch have order the microcontroller achieve the condition

5-2 The Method Test of Voice Alarm Unit:

The Test of the Voice Alarm Unit take two method Hard ware test , and Voice Alarm operation test in the hardware method test the microcontroller selection and mp3 according to switches conditions, in the Voice Alarm operation test the Voice Alarm in vehicle according to malfunction in the system .

5-2-1 Hardware test:

To test the microcontroller and mp3 select, the table (5-1) contain the microcontroller process, relay operate and MP3 select against order switches. In the selection operation of the voice alarm the researcher use two relays to energize and de energize (move up and down) to set the desired voice alarm from MP3, and third relay to pause the MP3. The figure (5-2) shows the conceptual hardware test
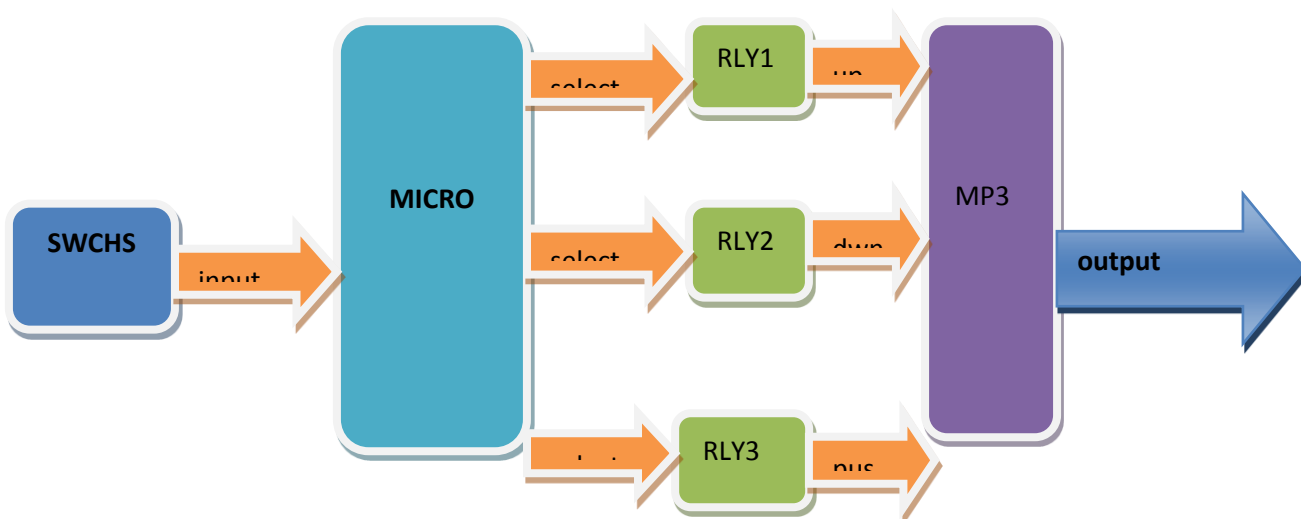

Figure (5-2) Conceptual Hardware Test

Table (5-1) Hardware Select

SWITCHES	MICRO	RELAYS			Mp3
SW1=1	PROCESS	RLY1 Up=1	RLY2 Don=1	RLY3 Pause=1	VOICE ALARM ONE
SW2=1	PROCESS	RLY1 Up=2	RLY2 Don=2	RLY3 Pause=1	VOICE ALARM TWO
SW3=1	PROCESS	RLY1 Up=3	RLY2 Don=3	RLY3 Pause=1	VOICE ALARM THREE
SW4=1	PROCESS	RLY1 Up=4	RLY2 Don=4	RLY3 Pause=1	VOICE ALARM FOUR

The Table(5-1) shows the microcontroller select the desired alarm by ordering the relay up one time and down one time and pause relay before and after the time of voice alarm according to first switch pressed, and the MP3 fetch the first voice alarm. When switch2 is pressed the microcontroller select the desired alarm by ordering the relay up two times and down two times and pause relay before and after the time of voice alarm, and the MP3 fetch the second voice alarm. When switch3 is pressed the microcontroller select the desired alarm by ordering the relay up three times and down three times and pause relay before and after the time of voice alarm, and the MP3fetch the third voice alarm. When switch4 is pressed the microcontroller select the desired alarm by ordering the relay up fourth time and down fourth time and pause relay before and after the time of voice alarm, and the MP3 fetch the fourth voice alarm.

5-2-2 Voice Alarm Unit operation Test:

The Voice Alarm operation test the Voice Alarm in vehicle according to troubling in the system, the researcher select Hyundai vehicle Tucson model 2011 to perform test of Voice Alarm Unit operation.

In TUCSON vehicle we select ECU, ABS, AIRBAG, and 4WD systems to test the operation of Voice Alarm Unit.

The ECU (engine control unit) is main control of vehicle which controls the performance of engine and it contains sensors to sense the desired value to make action through actuators to control and improve engine performance.

The ABS (antilock brake system) is control of break performance, which contains sensors and actuators to improve the break performance.

The SRS is the supplemental restraint system (SRS) is designed to Supplement the seat belt to help reduce the risk or severity Of injury to the driver and passenger by activating and deploying the driver, passenger, side air bag and belt pre-tensioned in carat in frontal or side collisions.

The 4WD system is an automatic variable 4 wheel driving gear. This system distributes an optimum driving torque to front and rear wheels according to a driving condition (a road condition or driving condition). The 4WD ECU receives sensor inputs and determines the power distribution for the front/rear wheel. Then it controls a coupling system to transfer driving torque to rear wheels.

To Test the Voice Alarm Unit operation it must make trouble in systems by remove any sensor for example injectors Figure(5-4) in ECU, wheel sensor in ABS Figure(5-5), impact senor in SRS Figure(5-6), and actuator of 4WD Figure(5-7). The Figure (5-4) shows the conceptual Voice Alarm operation Test
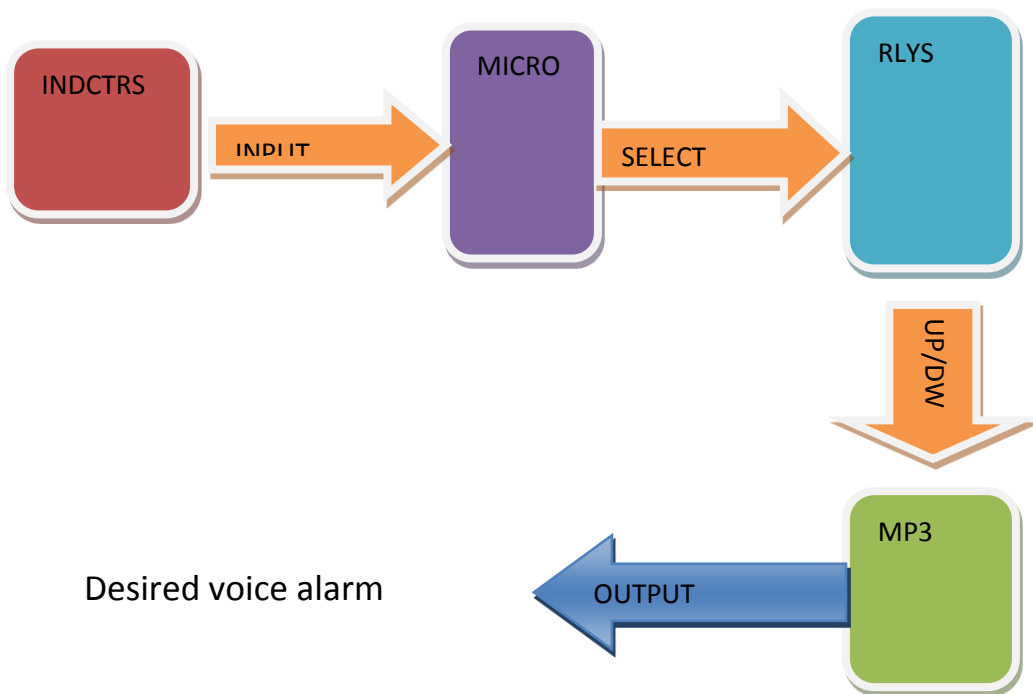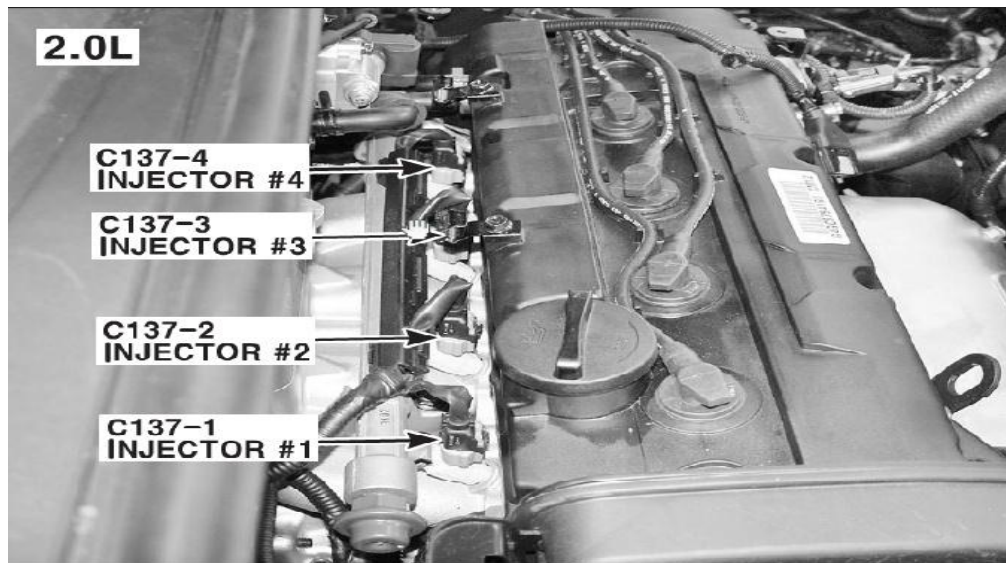
INDCTRS

INPUT

MICRO

SELECT

RLYS

UP/DW

MP3

Desired voice alarm

OUTPUT

Figure (5-3) conceptualVoice Alarm Unit TEST
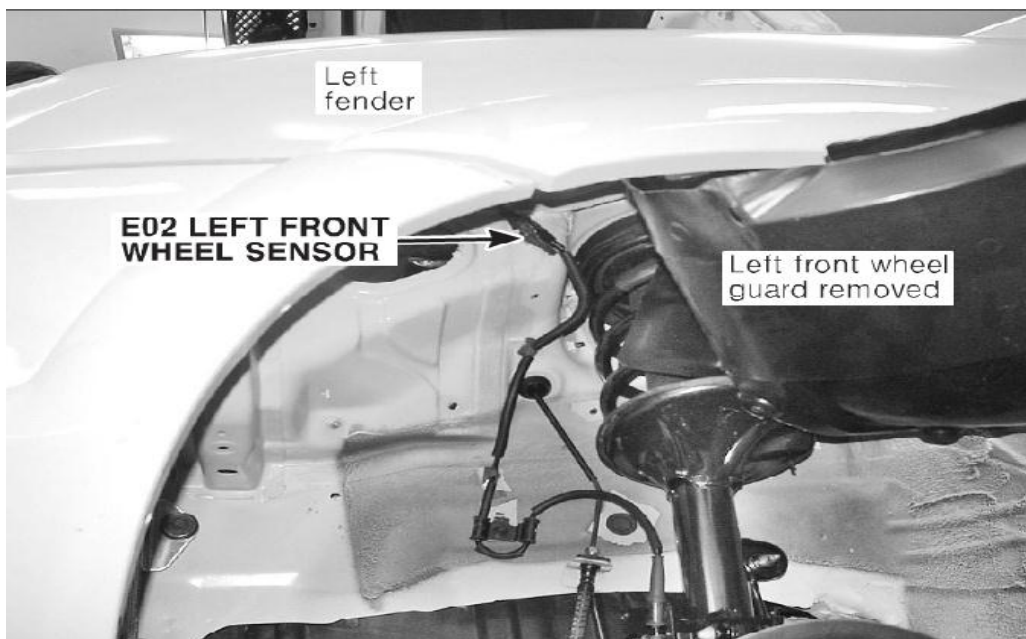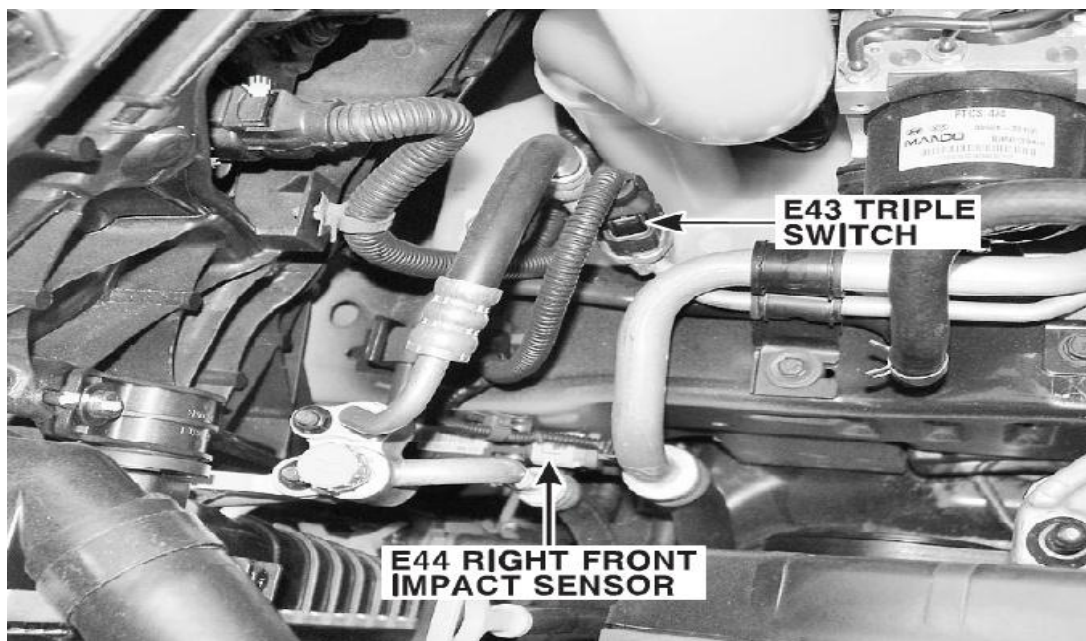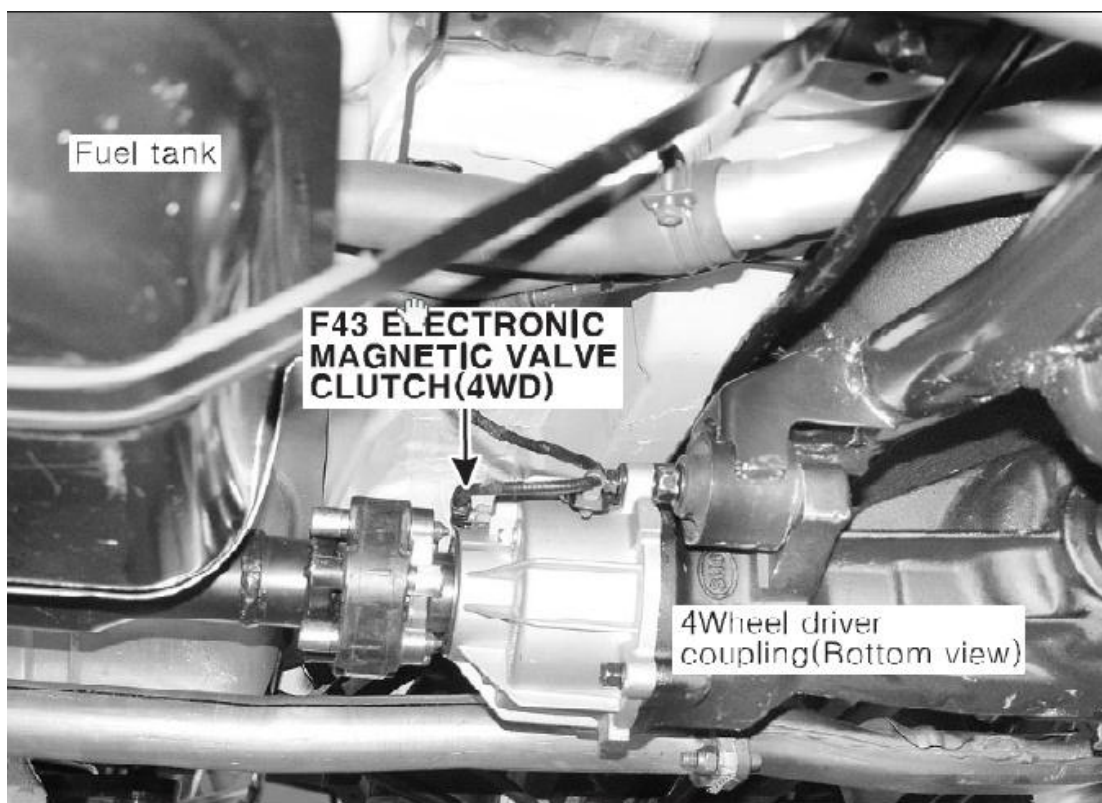
Figure(5-4) injectors

Figure (5-5) wheel sensor

Figure(5-6) impact sensor

Figure(5-7) Actuators

The Table(5-2) shows the Voice Alarm operation Test which show the trouble and Microcontroller process and MP3 select

Table (5-2) VACU operation test

INDICATOR ON	MICRO	RELAYS			Mp3
Chick engine	PROCESS	RLY1 Up=1	RLY2 Don=1	RLY3 Pause=1	Chick light voice
ABS	PROCESS	RLY1 Up=2	RLY2 Don=2	RLY3 Pause=1	ABS light voice
SRS	PROCESS	RLY1 Up=3	RLY2 Don=3	RLY3 Pause=1	SRS light voice
4WD	PROCESS	RLY1 Up=4	RLY2 Don=4	RLY3 Pause=1	4WD light voice

The Table(5-2) shows the Microcontroller select the desired alarm according to light indicator on, and the MP3 fetch the voice alarm. When remove injectors chick light comes on and the microcontroller select the desired alarm, and the MP3 fetch the chick light voice. When remove wheel sensor ABS light comes on and the Microcontroller select the desired alarm and the MP3 fetch the ABS voice.

When remove impact sensor SRS light on and the Microcontroller select the desired alarm and the MP3 fetch the SRS voice When remove the actuator drive 4WD light comes on and the Microcontroller select the desired alarm and the MP3 fetch the 4WD voice

CHAPTER SIX

CONCLUSION AND RECOMENDATION

CHAPTER SIX: CONCLUSION AND RECOMENDATION

6-1 CONCLUSION:

The Multi systems in vehicles make problem to understand the state of system on vehicles and that can make the vehicles owner at the mercy of professionals which can deceive him and utilize his ignorance to make money without to solve his problem because his never went to the specialist which can solve his problem. This research shows alarms of the automation systems on dash board in the vehicles and how explain this light alarm for driver vehicle, and the importance of the voice alarm for the driver human to get information easily to understanding. The researcher Designed model to inform the driver directly and phonetic concurrently with the instrument cluster what is this indicator light and which one system belong it. The researcher designed the Voice Alarm Unit module using microcontroller ATMEGA family to receive the signal from automatic systems concurrently with instrument cluster. implement system by connect Microcontroller with 12V regulator and MP3 module to store Alarms on memory and use TDA2003 Amplifier to amplify the signal of Alarm when take place And Test the system by connected with the dashboard of vehicle to receive the signal of alarm concurrently and select the alarm voice according to the signal and amplify this voice for vehicle speaker to clear and understandable voice using recorder module that driver can understanding it.

6-2 Recommendations:

- The Voice Alarm Unit used with analog instrument panel which means use analog signal and that can form limited use for analog system of dash board without digital system of dash board
  To solve this problem it must connect the VACU with CAN line protocol.

- The process of fetching alarm throw relays selection is unreliability for some reason

- Relays order make delay time in select voice alarm
- Subjected to lost order in select operation according to coil magnetic and contact point
- Make difficult soft ware code

- The future vision for the Voice Alarm Unit to be Voice Diagnose Alarm Unit which can connect it directly with controller system to read the status of system.
- This Voice Diagnose Alarm Unit can read the trouble code and give for the driver the possibility for the solution.

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