

# Vehicle Surveillance Alarm System in Focus of Application Software

by

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Dissertation submitted in partial fulfillment of

the requirements for the

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(Information Systems)

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CERTIFICATION OF APPROVAL

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A project dissertation submitted to the  
Information System Program

Universiti Teknologi PETRONAS

In partial fulfillment of the requirement for the  
BACHELOR OF TECHNOLOGY (Hons)  
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Approved by,

A handwritten signature in black ink, appearing to read 'Helmi', with several horizontal lines drawn underneath it.

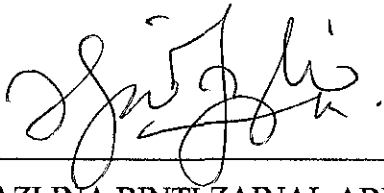
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June 2004

## CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the original work is my own except as specified in the references and acknowledgements, and that the original work contained herein has not been undertaken or done by unspecified sources or persons.



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AIDA FAZLINA BINTI ZAINAL ABEDIN

## **ABSTRACT**

Society has been very concern about the important of safety and security that leads the manufacturing company to design several of security systems ranging from the simple to complex systems. This report present information on the research involves in Vehicle Surveillance Alarm System, which is purposely design for vehicle security and safety since most of the road transportation lack of security and safety features, which may cause vehicle fatalities that increase from year to year. Hence, the function of the Vehicle Surveillance Alarm System is to trigger an alarm if any abnormal condition happens to inform and alert the vehicle driver about the situation through the use of advance warning messages. This research covers the studies of the application software that involves with manipulating data from the serial port and displaying the data into a proper GUI design. This report features the introduction that explains the background of study, problem statement, significant of the project, objectives and the scope of study of the project research. The author also writes the literature review or theory from several researchers for supporting information or reference to support the project research. The software development methodology use by the author for the project research is taken from several steps of Software Development Life Cycle and Waterfall Model in order to suit the research needs, which also used the concept of static data applied in the prototype. Procedure identification is briefly discussed in order to complete the research and describe tools of hardware and software use to design the product. The author visualize the results of the findings and discusses more details on the serial interface, database storage and GUI interface of the system including the software chosen to accomplish the project of the Vehicle Surveillance Alarm System. The author writes the conclusions and recommendations for further research and future enhancement that includes in the final chapter of the report. The end-result of the research is the static vehicle alarm system software prototype that satisfies the basic needs of vehicle alarm system. The prototype visualize how the vehicle alarm system enables the vehicle driver to be alert by any uncertainty behaviors from the vehicle component, retrieve and view available data of the surveillance history records through the system.

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## **ABBREVIATIONS AND NOMENCLATURES**

PC	Personal Computer
DBMS	Database Management System
GUI	Graphical User Interface
RAM	Random Access Memory
RDBMS	Relational Database Management System
OODBMS	Object-Oriented Database Management System
ORDBMS	Object-Relational Database Management System
RTU	Remote Terminal Unit
IEEE	Institute of Electrical and Electronic Engineers, Inc
PIC	Programmable Integrated Circuit
MSComm	Microsoft Comm Control 6.0
SDLC	Software Development Life Cycle

# **CHAPTER 1**

## **INTRODUCTION**

### **1. INTRODUCTION**

This chapter provides the introduction of the project featuring its background of study, the problem statement, objectives and the scope of study of the project research area. This report present the information and knowledge on designing an alarm system that focus on the software application. This report covers the processes that involves from data retrieving from the circuitry sensor, data capturing into the database and displaying the result or signs on the graphical user interface for advance notification.

#### **1.1 Background Study**

Security and safety on motor vehicles is vital since motor vehicle plays a primary role in the movement of human and goods. Thus, an early detection of any uncommon behavior from the vehicle parts and components is crucial to prevent from any accident and damage to happen. Take a look on the scenarios if the level of vehicle temperature is high and at the same time the level of fuel tank drastically reduced causes by the leaking may cause the vehicle to collide and burn into fire. Accidents and damage cause from the motor vehicle may give a great impact to those involves such as company will loss their revenues, humans will loss their live, the vehicles manufacturer will have bad reputation as they are blamed for not installing high security features in the vehicle and other circumstances. Therefore, the studies of the project research goals are to come out with one security features for motor vehicles that outfit the basic needs of an

alarm system, which is the Vehicle Surveillance Alarm System. The research studies involves the software application of receiving data from the circuitry sensor through the serial communication port and store the data into Vehicle Surveillance Alarm System and display the result in graphical user interface by indicating the uncommon behavior from the vehicle parts component to the vehicle driver. The research study also cover the appropriate and suitable software use to design the system that capable to support the serial communications and allows interfacing with database applications. User friendly graphical user interface design is important and will be an added value to ensure that the vehicle driver use the system effectively for accident prevention. Thus, the project research covers the studies on effective and usability graphical interface for Vehicle Surveillance Alarm System. Therefore, the research goal for the alarm system is to enhance security and safety features to be installed in the motor vehicle for accidents preventive. The designing process of surveillance and alarm system is very crucial to ensure that the system will be accepted by the user.

The Vehicle Surveillance Alarm System process involves with retrieving data from the sensor, where the data will be then transfer to the application program at the pc through a serial port. The Vehicle Surveillance Alarm System sensor will have the input from several sensor such as the rpm sensor, speed sensor, fuel sensor and heat sensor, but for this project it will focus on the temperature and fuel sensor. If any uncommon behavior signals detected from these sensors, it will automatically trigger the alarm instantaneously alert and warn the vehicle driver before major danger and risks occur. The research also covers the study on effective and usability of GUI design to publish indicators and warnings of any error or breakdown component on the vehicle. The applicable database system is being use to record the surveillance data detected from the sensors. This project research also involves with thorough research on the connection between the circuit sensors and the application program through the serial communication port.

## 1.2 Problem Statement

Motor vehicles play a primary role in the movement of goods and people, and the machines that provide their users with pleasure. Thus, improvements on the safety in the motoring world are vital. Yet, the fact that motor vehicles are driven by people having varied abilities and different personalities leads to mistakes resulting in road accidents. In terms of collision safety and preventive safety, motor vehicles today are great improves over what it was 30 years ago, and the roads have been upgraded considerably. Unfortunately, however, road transport still lacks the vital clement that would radically reduce the number of accident victims. It is important to think about how mechanical system can supplement the abilities of driver that looks into providing accident avoidance performance which considering the moment immediately before an accident happens by providing advance notification to the vehicle driver.

Drivers are only be able to obtain information through their eyes and ears. This information is as limited as the narrow ranges of their eyesight and hearing. Thus, it is important to have an alarm system that can support for this limitation such as make use of sounds and notification to alert and warn the driver of any uncommon behavior that comes from parts of vehicle components because failure to detect the problems may cause damage to the driver, passenger, and the vehicle itself.

It is also essential to record the history of surveillance for any inspection or references in the future. The record should be precise, accurate and easy to fathom to accommodate users of various backgrounds.

The project of Vehicle Surveillance Alarm System is significant to design a system that can increase the levels of security and safety in motor vehicles. Hence, the system provides an alarm system function that helps to minimize the driver, passenger and the vehicle exposure to high levels of risks and danger.

### **1.3 Objectives and Scope of Study**

The objectives of the Vehicle Surveillance Alarm System project research are as follows:-

1. To come out with vehicle alarm system that can inform and alert the user of any uncommon behaviors happen at the parts of vehicle.
2. To publish indicators and warnings of any parts error or failure component on the vehicle.
3. To studies the connection of circuit sensor to application software through the serial port.
4. To studies on effective and usability of GUI between the user and system.
5. To studies on appropriate database interface usage for the Vehicle Surveillance Alarm System.

The scopes of studies for the Vehicle Surveillance Alarm System project research are as follow:-

1. Research on the communication interface that can establish connection between the hardware application and the software application.
2. Study the software application that can allow interfacing with both serial interface and with database applications.
3. Study on the applicable database system that can be interface with software application to record the receiving data from the sensor circuitry.
4. Specifically study on the effective, usability and user friendly GUI interface to publish indicators and warnings of any error detected by sensor from the vehicle parts components.

## **CHAPTER 2**

### **LITERATURE REVIEW AND THEORY**

#### **2. LITERATURE REVIEW AND THEORY**

Chapter 2 provides information on several reviews of the alarm system design ranging from the simple to complex alarm system. This chapter also provides reviews on the software applications with various theories of serial interface, database interface and GUI interface that contains the findings which consists of relevant theories, hypotheses, facts and data that relevant to the objective and findings of the project research.

#### **2.1 Alarm System Design**

Knowing that an alarm system can contribute to prevent vehicle accidents and fatalities has lead many individual researchers and manufacturing companies to come out with an alarm system design. There are various kind of alarm system design ranging from a simple and basic design for a small application to a more complex design that suits for a bigger system. Basically, the alarm system design must be base on the needs and requirements of environments that the system needs to fulfill. The author will review the design from a simple basic design to more complex design in order to have clear view and understand the alarm system design.

### 2.1.1 Real-Time Surveillance and Tracking System

Raja Danir Ikram Bin Raja Shahrome (2003) has done research project on designing Real-Time Surveillance and Tracking System. The system is design to construct a real-time surveillance tracking system that alert and inform use of any incident beyond the normal. According to the research thesis, there are four steps of the system procedures that being involves in the implementation. These steps are the startup to design surveillance and tracking system, thus it features basic procedures to design the system. Figure 1 is the block diagram which represents the overall attributes of the system. The basic structures of the system are as below:

1. The system has an input interface which consists of the microcontroller circuitry that connects the sensors, microcontroller and output components.
2. The serial interface is design to gather the feedback from the microcontroller to transmit to the serial port of a PC.
3. The GUI interface is design to extract the input from the serial port of the PC while allowing the user to monitor and track down the location details.
4. Lastly, the database interface is design to provide the necessary storage for the surveillance records.

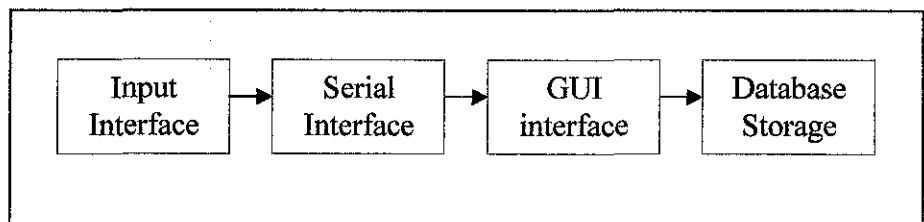


Figure 1: The Real-Time Surveillance and Tracking System Block Diagram



### **2.1.2 Process Alarm Toolkit**

Process Alarm Toolkit is an alarm system designed by Control Arts Inc. It is a wired alarm system, where the software offers its users to design and maintain alarm system at the optimum level by collecting, analyzing, and presenting alarm data. The software has four functionalities, which are the alarm capture, alarm analysis, alarm manager, alarm assistant, alarm enforcer, and enhanced messages as shown in Figure 2. Below are the descriptions for each of the functionality:

#### **1. Alarm Capture**

Automatically stores long-term journals to an SQL database and prints out daily summaries of alarms and operator moves.

#### **2. Alarm Analysis**

Determines what ails the alarm system such as redundant, ignored, chattering alarms and others.

#### **3. Alarm Manager**

Maintains a database of what the alarm settings should be, and expected operator responses to the alarms. Compares them to the actual alarm system to ensure your design matches plant expectations.

#### **4. Alarm Assistant**

Gives operators' instantaneous information on alarm events such as causes, consequences of ignoring, and expected responses.

#### **5. Alarm Enforcer**

Enables operators to temporarily change alarm limits based on local conditions, but ensures that the design limits are enforced on a scheduled basis.

## 6. Enhanced Messages

This feature provides a user-friendly message display for operations and a structured system for programmers.

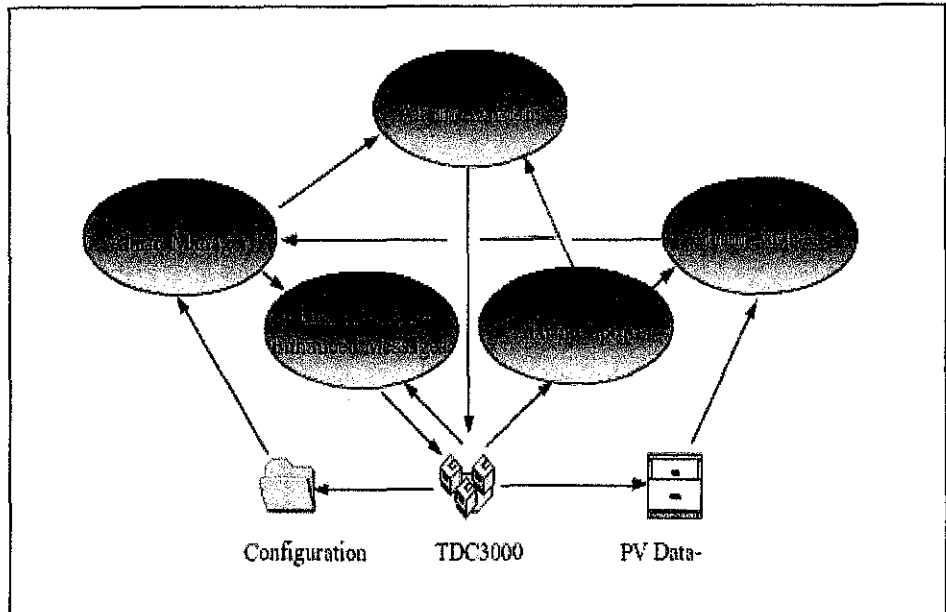


Figure 2: Process Alarm Toolkit Design

### 2.1.3 Site.Link Alarm System

SaskTel Mobility manufacturing company has come out with their own alarm system architecture, which is known as Site.Link. SiteLink system architecture suits for a complex alarm system architecture that caters for bigger functions. The Site.link provides all required components to capture data from and perform basic start and stop type control at the site. The basic components required at each location to include the sensors or instrumentation, the local controller, and the airlink radio or modem. Site.Link provides functions for data security, monitoring and control functions, alarm management, reports, downloading and the data cleanup cycle. Site.link provides wide range industrial sensors for monitoring, which are for the pressures, temperatures liquid and solid levels, liquid

and gas flow rates, and voltages. The Site.Link system is illustrated as shown in Figure 3.

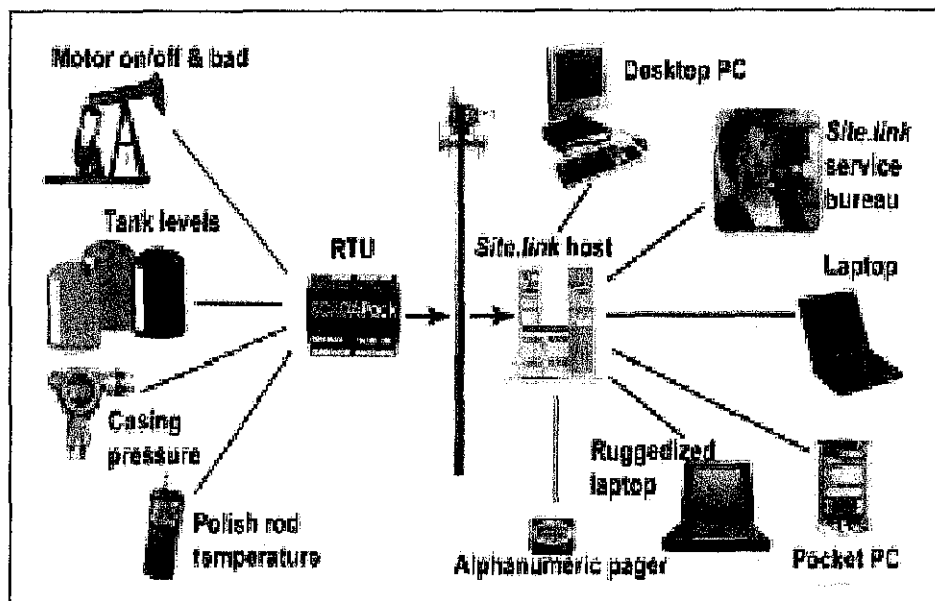


Figure 3: Site.Link Alarm System Design

There are three big components that run the alarm and monitoring system function, which are the controller and wireless modem, host and alarm call out and access methods. Below are the descriptions for the three components:-

### 2.1.3.1 Controller and Wireless Modem

The local controller is a single-board industrial computer called Remote Terminal Unit (RTU) which provides protection from extremes in temperature and weather. The RTU performs five critical functions, which are scan, store, react, forward and configure and control. Below are the descriptions of each function:

#### 1. Scan

The controller reads each instrument input once per second to collect its current reading and calculate relevant statistics, including minimum, maximum, and averaged values.

## **2. Store**

Summary readings and statistics are logged at a customer-selected interval and stored until a pre-defined report time. In event of an extended network outage, the controller can maintain several days worth of data in battery-backed memory until communications are restored, or an authorized user 'plugs in' to the controller and unloads the data locally.

## **3. React**

Each reading is assessed against a customer-provided set of limits to determine if a critical condition has occurred (for example, if a collection tank has filled past a specified limit, or an operating pressure has suddenly dropped). When this happens, the RTU generates an alarm message, and, if specified by the customer, can take autonomous action to shut down the site or a process.

## **4. Forward**

When a scheduled report is due, or an alarm is detected, the controller manages the airlink (usually, a Cellular Digital Packet Data (CDPD) modem or radio) to communicate the message to the **Site.Link** Communications Server. Data is maintained on the controller until the Communications server acknowledges that the data was received and validated by the **Site.Link** host system.

## **5. Configure and Control**

The controller monitors the airlink and processes control messages originating at the user interface. This allows the customer to change settings in the RTU or issue remote start or stop commands.

### **2.1.3.2 Host and Alarm Call Out Functions**

#### **1. Host**

Customer data reported by the field systems is stored by the Host Server in a shared high-performance database. This approach allows the cost of the systems, networks, facilities, and maintenance personnel to be spread across the entire **Site.Link** customer base. Security mechanisms built into the communications and database system ensure that each customer's data is protected from all users not explicitly authorized by the customer to access it.

#### **2. Alarm Call Out**

Customers may optionally elect to have a **Site.Link** operator conduct a manual call-out for very-high priority alarms. **Site.Link**'s operations centre operators are certified by Underwriter's Laboratories of Canada and trained to Security Industry Association standards in alarm management and dispatch.

### **2.1.3.3 Access Methods Functions**

#### **1. Access Methods**

Customers access **Site.Link** via the Internet. Both Netscape™ and Microsoft™ browsers are supported via a free browser 'plug-in' from Citrix Systems Inc. A link to this site is provided on the **Site.Link** web page. Windows NT, 9x, 2000, MAC-OS, and Linux operating systems are supported.

#### **2. Browser Plug-in**

The plug-in establishes easy access to the **Site.Link** software over the internet for users of PCs and mobile computing devices.

## **2.2 Communication Interface**

There are many types of input and output devices such as serial port, parallel port, disk drive controller, Ethernet boards, USB port and others. The input and output device is a medium of getting data into and out of a computer. Most common device uses to connect with microcontroller circuitry or the hardware application for example the sensor circuitry to the PC are through the parallel port or serial port. These two devices are being use commonly because normal and basic feature PC provides with this two devices. Therefore, communication can be done between the microcontroller circuitry and PC after establishing the connections of either the parallel port or serial port.

### **2.2.1 Parallel Interface**

Parallel port is a simple and inexpensive tool for building computer controlled devices and projects. The simplicity and ease of programming makes parallel port popular in electronics hobbyist world. The parallel port is often used in Computer controlled robots, PIC programmers, home automation and others. The primary use of parallel port is to connect printers to computer and is specifically designed for this purpose. The parallel port connector can be in the rear panel of PC. It is a 25- pin female connector to which printer is connected (Appendix 1). The pin connector can send data in bytes to the transmit pin that is the output and receive bytes from the receiver pin, the input. Usual normal features PC provides with only one parallel port (Craig Peacock, 1998).

### **2.2.2 Serial Interface**

Serial interface is the serial communications facilities, which are the integral parts of many embedded system. Serial communications is a data channel that transfers digital data in a serial fashion, one bit after the other,

over one wire or fiber. The serial communications port on a PC is an interface that is used to attach modems, scanners and other devices. The serial port is a device to get data input and output, which every PC must have at least one or two serial ports. The serial port might have 9-pin connector (Appendix 2). The serial interface comes in between the microcontroller circuitry and the serial port of the computer. The data transmitted from the microcontroller will be managed by two important components in order to complete the communications, which are the MAX232 and the RS232 (Recommended Standard 232, the Reference Standard #232 as referenced by IEEE), that is the universally agreed protocol for serial interfaces. The MAX232 is a component that converts 0V to 5V to swing between 12V to -12V, then it will go through RS-232 to complete the communication with the PC serial communication port (Craig Peacock, 2001).

## **2.3 Database Design**

A database system consists of one or multiple databases, a database management system (DBMS), and a set of application programs. The advances of database technology in the past few decades has created an environment where organizations and individuals can easily create, store or organize, retrieve, and process information instead of using filing cabinet or bundle of index cards for record keeping. Increasingly, database technology has become an integral part of operations and services of many organizations in different sectors, including business, engineering, health care, and education.

### **2.3.1 Database Management System**

DBMS must effectively store, access and manipulate data as well as provide data security, data sharing and data integrity. A DBMS can be an extremely complex set of software programs that controls the

organization, storage and retrieval of data (fields, records and files) in a database. It also controls the security and integrity of the database.

The DBMS accepts requests for data from the application program and instructs the operating system to transfer the appropriate data. When a DBMS is used, information systems can be changed much more easily as the organization's information requirements change. New categories of data can be added to the database without disruption to the existing system. There are three common types of DBMS that being used for designing applications, which are Relational Database Management System, Object-Oriented Database Management System, Object-Relational Database Management System. According to Aparna Varde (2002), there are several advantages of DBMS, which are controlling the redundancy, restrict unauthorized access, provide persistent storage for data, represent relationships among data, enforce integrity constraints, provide backup and recovery, and also be able to allow concurrency control.

### **2.3.2 Relational Database Management System**

According to Shawn Chin and Orjan Timan, (2003) a relational database allows the definition of data structures, storage and retrieval operations and integrity constraints. In such a database the data and relations between them are organized in tables. A table is a collection of rows or records and each row in a table contains the same fields. Certain fields may be designated as keys, which mean that searches for specific values of that field will use indexing to speed them up.

A join operation can be performed to select related records in the two tables by matching values in those fields, where fields in two different tables take values from the same set. Often, but not always, the fields will



have the same name in both tables. For example, an "orders" table might contain (customer\_id, product\_code) pairs and a "products" table might contain (product\_code, price) pairs so to calculate a given customer's bill you would sum the prices of all products ordered by that customer by joining on the product-code fields of the two tables. This can be extended to joining multiple tables on multiple fields. Because these relationships are only specified at retrieval time, relational databases are classed as dynamic database management system. There are several popular RDBMS packages, which are the Oracle 7.x, Microsoft SQL Server, IBM DB2 and Microsoft Access.

### **2.3.3 Object-Oriented Database Management System**

Object-Oriented Database Management System (OODBMS) is a system offering DBMS facilities in an object-oriented programming environment. Data is stored as objects and can be interpreted only using the methods specified by its class. The relationship between similar objects is preserved (inheritance) as are references between objects. Queries can be faster because joins are often not needed as in a relational database. This is because an object can be retrieved directly without a search, by following its object id. The same programming language can be used for both data definition and data manipulation. The full power of the database programming language's type system can be used to model data structures and the relationship between different data items.

Multimedia applications are facilitated because the class methods associated with the data is responsible for its correct interpretation. OODB typically provide better support for versioning. An object can be viewed as the set of all its versions. Also, object versions can be treated as full fledged objects. OODB also provide systematic support for triggers and constraints which are the basis of active databases. Most, if not all, object-

oriented application programs that have database needs will benefit from using an OODB (K. P. Krishna Kumar, 2001). The most known OODBMS packages are Jasmine developed by Computer Associates, Versant ODBMS, and Gemstone.

#### **2.3.4 Object-Relational Database Management System**

According to Ramakanth S. Devarakonda (2001), the main objective of ORDBMS design was to achieve the benefits of both the relational and the object models such as scalability and support for rich data types. ORDBMS employ a data model that attempts to incorporate object-oriented features into RDBMS. All database information is stored in tables, but some of the tabular entries may have richer data structure, termed *abstract data types* (ADT).

The ORDBMS has the relational model in it because the data is stored in the form of tables having rows and columns and SQL is used as the query language and the result of a query is also table or tuples. But the relational model has to be drastically modified in order to support the classic features of object-oriented programming. ORDBMS allow users to define datatypes, functions and operators. As a result, the functionality of the ORDBMS increases along with their performance. Among the popular ORDBMS packages are Oracle 8.x, IBM Universal Database (DB/2 Extenders). OSMOS developed by Unisys.

#### **2.3.5 Database Design Techniques**

According to Marnie Pehrson (2003), there are several design techniques that should be follow to ensure to ensure good database design. The techniques are as follows:-

**1. Begin with the end in mind**

First of all is to understand the requirement set by users who will be using the system and their feedback. Thus, communication with everyone that involved is critical to get the requirements information from the user.

**2. Sketch all reports first**

Possibly need to sketch the report first and must involve with the user.

**3. Determine the selection criteria**

Determine the type of sort or query for the database and develop the table structures.

**4. List all the fields needed**

Brainstorm and write everything down on fields that might need. Need to specify the lengths and data types of each field.

**5. Group the fields together**

For example if creating a customer database, need to place all the customer contact information in one table, all the order information in another, and a history of contact with people in another.

**6. Make each table self-contained**

Eliminate redundant fields. For example, do not repeat the customer's name, address or phone number in other table that will make the tuples redundant.

**7. Assign key fields**

A key field is the column with which can be reference any given row in a table. It is what makes each row unique. For example, ContactID is the key field in Contact table. InvoiceNo is the key field in Invoices

table. Sometimes need to use a combination of fields to make each row unique. This is called a concatenated key. Use key fields to link tables together and look up information. Indexes on key fields can speed up queries and searches on the database.

#### **8. Decide on the relationships between tables**

Next is to decide on how to connect the tables. For example ContactID might be use in both a contact table and an order table to give them a common link.

#### **9. Layout the input screens**

Find out the most efficient way to enter information with a minimum number of keystrokes. If the database program supports subforms, need to learn first on how to use them. Then can start create the tables, forms, and the reports.

#### **10. Test the system**

Often designers do not find errors or missing fields until the database is fully loaded with data. It advisable to get feedback from anyone who will be using the database that offers suggestions and comments.

#### **11. The database is a living entity**

If the system needs to find new uses for custom database or need changes, then can return to the planning and design phases.

### **2.4 Graphical User Interface Design**

Jenny Preece (1998) has defines user friendly as the totality of surface aspects of a devices, the information presented to or elicited from the user, feedback presented to the user, the system's behavior, its documentation and associated training programmes, and the user's actions with respect to these aspects. The simpler

meaning is the means of communication between the information system and the user, where the hardware and software products designed to enable a user to access and use information systems functions. Several tips for designing an interface are:-

1. Set standards and stick to them.
2. Explain the rules of the application.
3. Support both novices and experts.
4. Consider the navigation between screens.
5. Concern on the navigation within a screen.
6. Word all the messages and labels appropriately.
7. Use color appropriately.
8. Use contrast appropriately.
9. Use fonts appropriately.
10. Gray things out and do not remove them.
11. Use non-destructive default buttons.
12. Do not create busy screens.
13. Align fields and justify data.
14. Groups things on the screen effectively.

#### **2.4.1 User Interface Design Principles**

User interface design principles are essential for system design as the system developer must take into account of the needs, experience and capabilities of the system users. Designers should be aware of people's physical and mental limitations of user. Below are the user interface design principles, which are the primary considerations for interface designs although not all principles are applicable to all designs (Philadelphia, 2002). There are a number of principles that should be kept in mind when designing a user interface, which are:-

### **1. Know the system user**

It is perhaps the single most cited guideline in user interface guidelines. Yet, sometimes it is hard to make assumptions on user population.

### **2. Minimizing the load on users**

This implies reducing the memory and cognitive load, providing informative feedback, memory aids, and other cognitive supports. It is also important to ensure that a work session can be easily interrupted for a few minutes without losing the work in progress as people are able to focus attention for a limited amount of time only.

### **3. Preserving consistencies**

There are many consistencies to be preserved in a user interface: labeling, terminology, graphic conventions, components, layout, and so on. Many guidelines, principles, and even software design systematic approaches, are oriented towards consistency.

## **2.4.2 Usability in Software Design**

Usability addresses the relationship between tools and their users. In order for a tool to be effective, it must allow intended users to accomplish their tasks in the best way possible. In order for these systems to work, their users must be able to employ them effectively. Usability is a measure of how easy it is to use a product to perform prescribed tasks (Microsoft Corporation, 2000).

Usability depends on a number of factors including how well the functionality fits user needs, how well the flow through the application fits user tasks, and how well the response of the application fits user

expectations. Usability system makes it easy to learn, easy to use, easy to remember, error tolerant, and subjectively pleasing.

From the user's perspective usability is important because it can make the difference between performing a task accurately and completely or not, and enjoying the process or being frustrated. From the developer's perspective usability is important because it can mean the difference between the success or failure of a system. From a management point of view, software with poor usability can reduce the productivity of the workforce to a level of performance worse than without the system. In all cases, lack of usability can cost time and effort, and can greatly determine the success or failure of a system. Given a choice, people will tend to buy systems that are more user-friendly.

The key principle for maximizing usability is to employ iterative design, which progressively refines the design through evaluation from the early stages of design. The evaluation steps enable the designers and developers to incorporate user and client feedback until the system reaches an acceptable level of usability. The preferred method for ensuring usability is to test actual users on a working system. Achieving a high level of usability requires focusing design efforts on the intended end-user of the system. There are many ways to determine who the primary users are, how they work, and what tasks they must accomplish. Some alternative methods include user testing on system prototypes, a usability inspection conducted by experts, and cognitive modeling.

Usability is one of the focuses of the field of Human-Computer Interaction. As the name suggests, usability has to do with bridging the gap between people and machines. A user interface or human-computer interface refers to the parts of a hardware and or software system that allow a person to communicate with it. This includes output devices,

which is the way the computer talks to a user and input devices, which is the way a user talks to the computer. Typical output devices include computer monitors and the windowing systems that run on them, but also include speakers and other devices that provide feedback. Input devices include peripherals like keyboards, mice, and joysticks, but also include microphones and even eye movement devices. Each of these interface components have devices corresponding to the visual for sight, aural for sound, and haptic for touch channels of the brain.

## 2.5 Improve the Transportation Safety

The graph shown in Figure 4 is taken from the research done by Highway Planning Unit, Ministry of Work Malaysia. The objective of the research is regards to identifying and measuring the Malaysian Quality of Life Index. The graph has illustrates that the vehicles fatalities keep on growing from the year of 1970 to the year of 1997. It is expected to growth more for the future. Safety and security on vehicles are important as one factor of contribution to reduce the number of vehicles fatalities in Malaysia.

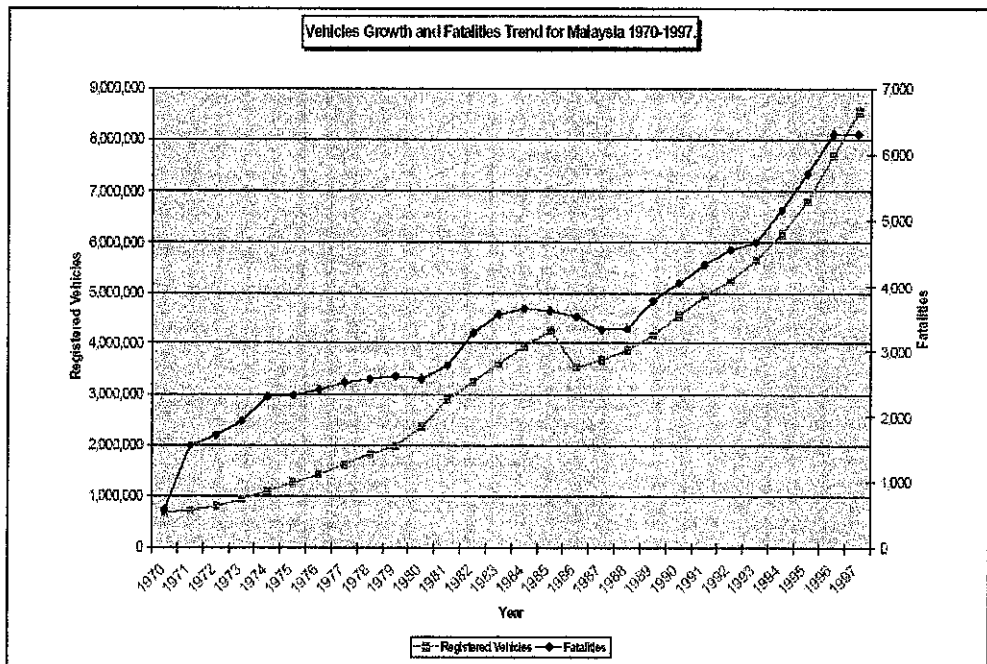


Figure 4: Vehicles Growth Fatalities Trend for Malaysia 1970-1997



According to Robert F. Randolph the Research Psychologist from U.S. Department of Energy, Pittsburgh and Spokane Research Centers in 1995, the U.S. Bureau of Mines laid out new initiatives for improving surface transport truck safety based on a history of research. Several strategies are being investigated, including improved operating practices, hazard recognition, and safety and warning devices. Equipment manufacturers are working to incorporate alarms, improve vision, and improve ergonomics on large equipment. One of the research project aimed is for the early warning detection. Existing and developing sensing technology will be reviewed to determine what systems might be easily incorporated onto existing equipment or into current operations to provide warning to drivers, operators and others in the immediate proximity. The engine performance such as rpm, oil pressure and machine operating conditions such as speed, tilt and load will be reviewed as possible parameters that could be used or recorded to define machine operating safety. This shows, nowadays the advance warning system like alarm system is essential to be implement or install in vehicle as it is one of the factor that can contribute to ensure safety and security in transportation.

## CHAPTER 3

### METHODOLOGY / PROJECT WORK

#### 3. METHODOLOGY AND PROJECT WORK

Chapter 3 describes the methodologies and project work procedures throughout the research. This methodology complies with the development process of the Vehicle Surveillance Alarm System prototype. Several phases from the SDLC and Waterfall Model have used to come out with one methodology that suits with the project research work.

##### 3.1 System Development Life Cycle

System Development Life Cycle (SDLC) is a phased approach to analysis and design which holds that systems are best developed through the use of a specific cycle of analyst and user activities (Kenneth E. Kendall and Julie E. Kendall, 1998) that plan and manage the systems development process. Figure 5 shows the seven phases of SDLC.

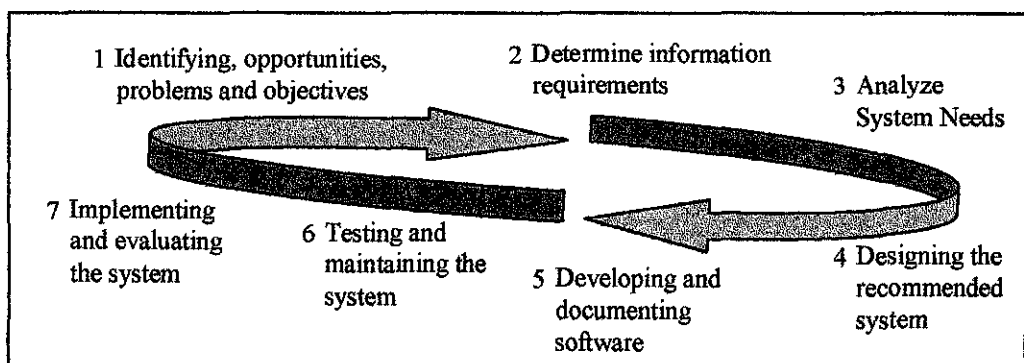


Figure 5: The Traditional System Development Life Cycle

### 3.2 Waterfall Model

Waterfall method has many advantages, as it is the most direct way to the objective with the shortest development time and cost possible. It is currently the most commonly used for software development. Waterfall models identify its goals as project identification and selection, initiation and planning, analysis, design, implementation and maintenance (Hoffer, 2002). Figure 6 illustrates the Waterfall Model phases for software development life cycle.

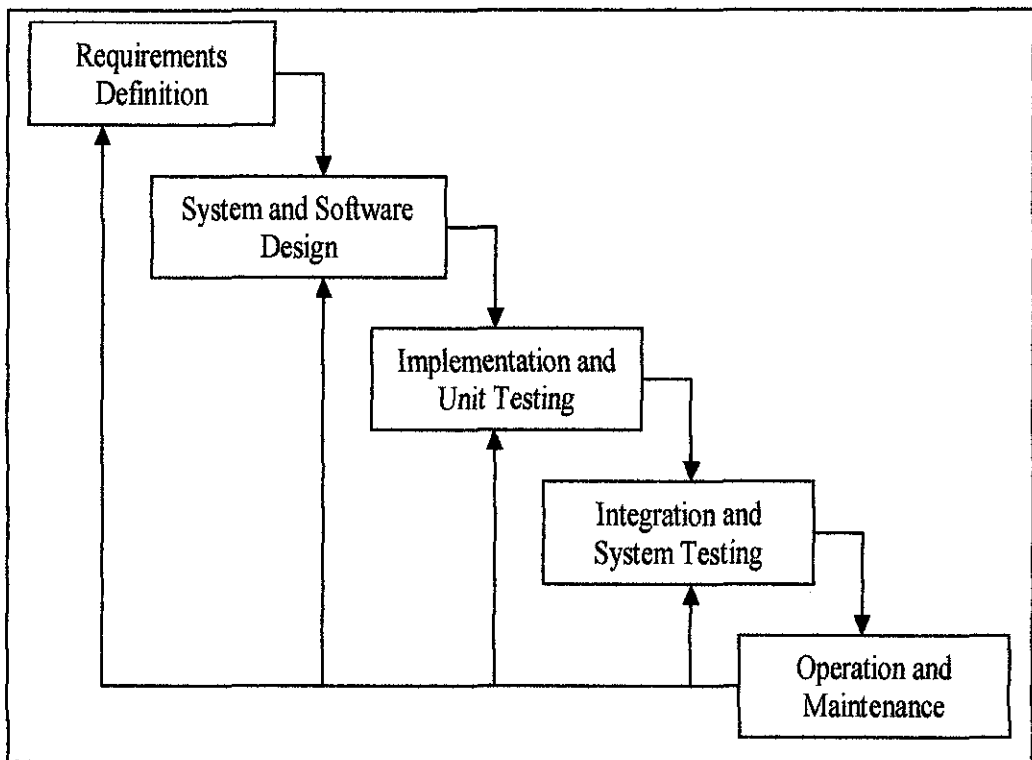


Figure 6: Waterfall Model

### 3.3 Methodology Applied for the Research Project

The combination of several phases from the SDLC and Waterfall Model has been used as the methodologies for completing the research project. The reason for using some phases from the SDLC is because it is dynamic and constant changes are common. For Waterfall model, each step of the phases must be completed and

accepted before the next step can begin and, generally, none of the steps can be overlap. The Waterfall model is used to counteract the disorganized habits of early systems development work.

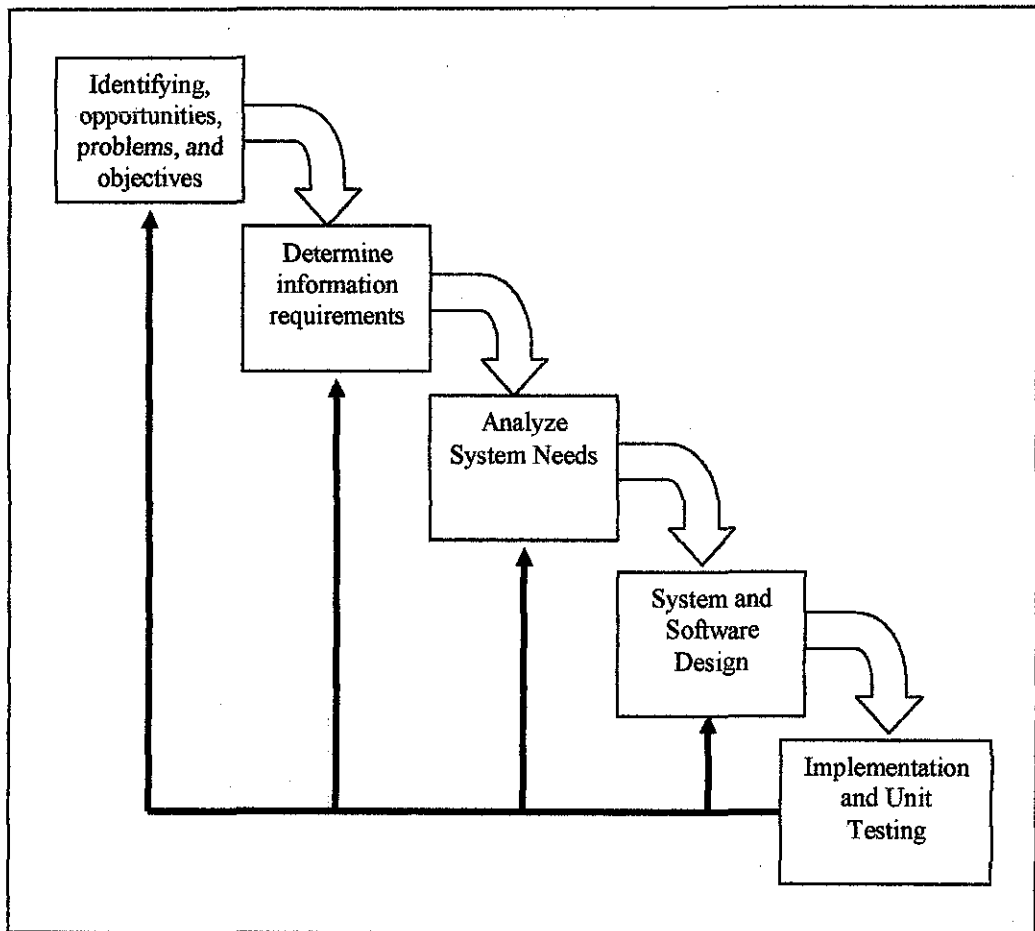


Figure 7: Methodology Applied for the Research Project

### 3.3.1 Identifying Opportunities, Problems, and Objectives

This stage is the critical success to the rest of the project, it is important to address the right problems which come out with problem statement. Then identify on what is occurring in a business through revising the literature review from various theories and point of views. Next, identifying the opportunities where the situation that the author believes can be improved

upon through the use of computerized information systems that help to specify the scope of studies of the research project. Then, it involves identifying the objectives of the research that see on some aspect of information technology applications that can help the system reach its objectives by addressing specific problems or opportunities.

### **3.3.2 Determine Information Requirements**

Determine the information requirements involved participation and interacting with users. These requirements can give the author to visualize the picture of the objectives. Need to know the details of the current system functions, who is the user involved, what the functions activity are, where the environment takes place and how the current procedures are performed. The requirements gathering process is intensified and focused specifically on software application of the Vehicle Surveillance Alarm System. During this phase, it is important to understand the required function, performance, and interfacing in order to establish precisely what the system is supposed to do and understand the nature of the program to be built. The requirements specification describes what the software must do to meet the requirements.

### **3.3.3 Analyze System Needs**

This phase involved analyzing the system needs by identifying the process flow of the system. The analyzing is effectively done through constructing the object modeling with unified modeling language, which is the activity diagram (Appendix 4).

### **3.3.4 System and Software Design**

This phase focuses on how the system will be working, the interface design that comply to what interfaces the system going to look alike and the data design that the system need. This stage also concerned with identifying and modeling the software structure, using information supplied in the requirements definition specification. It defines the essential software components for the system, how these fit together and how they communicate.

The logical design can be accomplish through the use of information collected on the earlier stages. The logical design provides the effective input to the information system by using techniques of good form and screen design. It involves with devising the user interface using Graphical User Interface (GUI). Designing the interface that connects the user with the system is very important. This phase includes designing files or databases that store much of the data needed. At this phases, users are involves with the work of designing the design output on screen printed that meet the information needs.

### **3.3.5 Implementation and Testing**

During this phase, the designs are translated into code. This is where the programming and coding development involves. Once code has been generated, program testing begins. The testing is done to catch the problems before it will be use. A series of testing has been completed by the programmers and users to ensure that the prototype design are free from error and meet the specified requirements.

### **3.4 Tools Required**

For hardware requirements, the system needs a computer with specifications of the minimum Intel Pentium III that running on Windows operating system with processor of 128MB RAM and D-9 (serial communication port). The complete system requires sensor circuitry that consists of RS-232 port connector, MAX-232 level converter and sensors for the speed, temperature, and fuel.

The software requirements for the system are the minimum of Microsoft Windows 98 and above. The systems also require database software for database storage purposes such as Microsoft Access 2000, which is sufficient to store the data for this research project. Microsoft Visual basic 6.0 is required for prototype development purpose.

## **CHAPTER 4**

### **RESULTS AND DISCUSSIONS**

#### **4. RESULTS AND DISCUSSIONS**

This chapter gathers all the findings and results of the research project, base on the information from several journals, reference books and resources. The author has come out with a new system architecture that satisfies and suits for Vehicle Surveillance Alarm System research project requirements. Furthermore, applicable serial interface, database and effective GUI have been identified for the use of the Vehicle Surveillance Alarm System.

##### **4.1 The Vehicle Surveillance Alarm System**

A new alarm system architecture that is Vehicle Surveillance Alarm System has been designed. The design is basically comply with the basic features of Real-Time Surveillance and Tracking System done by Raja Danir Ikram Bin Raja Shahrome because its suits and appropriate to be apply for Vehicle Surveillance Alarm System design. The other alarm system design theories that has been review earlier, which is the Alam Process Toolkit and Site.Link is no suitable to be apply since the design are suitable for a complex alarm system that cover for bigger functions. Moreover, one of the objectives for the research project is to satisfy basic design of an alarm system. Furthermore, the author has made some modification and changes on the Real-Time Surveillance and Tracking System to cater the requirement for Vehicle Surveillance Alarm System design. Figure 8 shows the design of the Vehicle Surveillance Alarm System that consists of serial interface, database storage and GUI interface.



The research project is basically focus on the design of the application software, which starts from receiving the input data through serial interface to the database application and display the output on the GUI interface screen. The serial interface will be use to gather feedback from the hardware to be transfer to the serial port of a computer. The database storage will be use to provide the necessary storage for the hardware input records. The GUI interface is needed to extract the input from the serial port of the computer while allowing the user to monitor and track down the location in details.

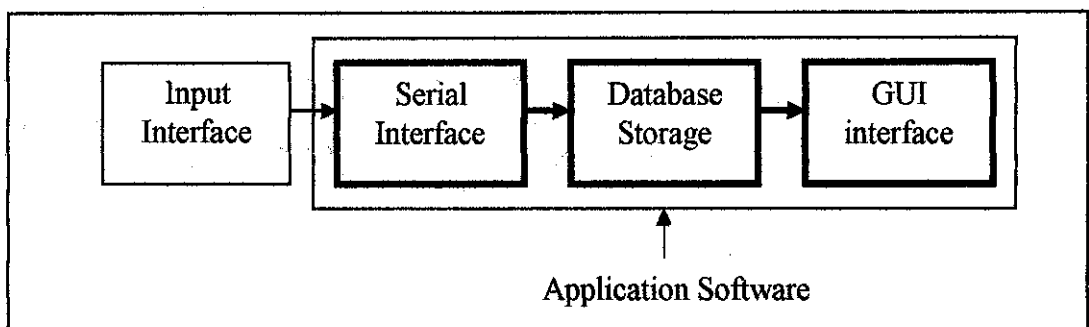


Figure 8: The Vehicle Surveillance Alarm System

The structures and process flow of the Vehicle Surveillance Alarm System are as follows:-

### 1. Serial Interface

The system will start its process from the serial interface, which is design to gather the feedback from the input interface to transmit the data back to the serial communication port.

### 2. Database Storage

The data received will then be automatically stored at the database storage for record keeping and history checking. The DBMS software used is the Microsoft Access.

### **3. GUI Interface**

The data will be extracting from the database to be display at the GUI interface to allow user to monitor and track down the location details. Microsoft Visual Basic 6.0 will be used to design the GUI application.

#### **4.2 Serial Communication Interface**

Hardware application of sensor circuitry needs to have a medium to communicate or send data to the PC software application. Thus, the serial communication interface has been used as a communication medium between hardware and software application since it supports several advantages even though the serial port is harder to interface than the parallel port because in most cases, any device that connect to the serial port will need the serial transmission converted back to parallel so that it can be used.

The advantage of using the serial port is because the serial cables can be longer than parallel cables. Furthermore, the serial port transmits a '1' as -3 to -25 volts and a '0' as +3 to +25 volts where as a parallel port transmits a '0' as 0v and a '1' as 5v. Therefore, the serial port can have a maximum swing of 50V compared to the parallel port which has a maximum swing of 5 Volts. For this reason, cable loss is not going to be as much of a problem for serial cables as they are for parallel. Moreover, the serial port does not need as many wires as parallel transmission. If the device needs to be mounted a far distance away from the computer then 3 core cable (Null Modem Configuration) is going to be a lot cheaper that running 19 or 25 core cable.

MAX232 and RS232 will manage the data transmitted from the microcontroller The MAX232 is a component that converts 0V to 5V to swing between 12V to -12V, then it will go through RS-232 to complete the communication with the PC serial communication port.

In order to connect the serial interface with the software application, Microsoft Comm Control 6.0 will be needed to establish the connection. It is one component in Microsoft Visual basic 6.0 that provides serial communications for the application by allowing the transmission and reception of data through a serial port. Microsoft Comm Control 6.0 can establish a connection to a serial port that connect to sensor circuitry, issuing commands, exchanging data, monitor and respond to any events and errors encountered during a serial connection.

#### **4.2.1 Microsoft Comm Control 6.0**

The MSComm control provides the following two ways for handling communications, where the Event-driven communications is a very powerful method for handling serial port interactions. In many situations you want to be notified the moment an event takes place, such as when a character arrives or a change occurs in the Carrier Detect (CD) or Request To Send (RTS) lines. In such cases, use the MSComm control's OnComm event to trap and handle these communications events. The OnComm event also detects and handles communications errors. For a list of all possible events and communications errors, see the CommEvent property.

Events and errors can be detected by checking the value of the CommEvent property after each critical function of your program. This may be preferable if the application is small and self-contained. For example, when writing a simple phone dialer, it may not make sense to generate an event after receiving every character; because the only characters plan to receive are the OK responses from the modem.

Each MSComm control corresponds to one serial port. If there is need to access more than one serial port in the application, it must use more than one MSComm control. The port address and interrupt address can be changed from the Windows Control Panel. Since MSComm is used to do

the interfacing between the microcontroller circuitry and PC, initialization must be done first by modifying the settings that include:

Baud rate: 9600

Parity bit : None

Data bits : 8

Stop bits: 1

The steps for adding the Microsoft Comm Control 6.0 component to Microsoft Visual Basic application and the steps to do interfacing with the serial port shown in Appendix 3. The important properties of MSComm are shown at Figure 9.

<b>Properties</b>	<b>Description</b>
<b>CommPort</b>	Sets and returns the communications port number.
<b>Settings</b>	Sets and returns the baud rate, parity, data bits, and stop bits as a string.
<b>PortOpen</b>	Sets and returns the state of a communications port. Also opens and closes a port.
<b>Input</b>	Returns and removes characters from the receive buffer.
<b>Output</b>	Writes a string of characters to the transmit buffer.

Figure 9: Microsoft Comm Control 6.0 properties

### 4.3 Database Design

The most appropriate type of DBMS that can be used for the Vehicle Surveillance Alarm System is the Relational Database Management System. Relational database allows the definition of data structures, storage and retrieval operations and integrity constraints. In such a database the data and relations between them

are organized in tables. A table is a collection of rows or records and each row in a table contains the same fields. Certain fields may be designated as keys, which mean that searches for specific values of that field will use indexing to speed them up (Shawn Chin and Orjan Timan, 2003).

The relational databases are also classed as dynamic database management system that suits the needs for the Vehicle Surveillance Alarm System database design that cater the alarm system. Compared to other database such as OODBMS and ORDBMS, they are most suit to be implement for a complex database design that usually used by organization for bigger database that suits for many applications.

The most appropriate RDBMS package used for designing the Vehicle Surveillance Alarm System will be the Microsoft Access software. Since, Microsoft Visual Basic 6.0 is use to design the user interface and establish connection with the serial communication, it is most appropriate to use Microsoft Access since Microsoft Visual Basic can support RDBMS software.

The Vehicle Surveillance Alarm System is most appropriate to use with the Microsoft ADO Data Control 6.0 (OLEDB) and Microsoft DataGrid Control 6.0 (OLEDB), which are the components that Microsoft Visual Basic can support. ADO Data Control (ActiveX Data Control) is a control that connects to a remote database. ADO data control can be used with tied text boxes and with the new DataGrid. The ADO Data Control properties for AllowAddNew, AllowDelete and AllowUpdate can be set to False to avoid user to update or make changes on the database. The DataGrid can be set to read only for security purpose, where the user can see the data but are not permitted to update it and support for routine error prevention by making the control as a read-only that can help prevent accidental errors.

### **4.3.1 Microsoft Access**

According to Mohd Faizal Othman (2003), Microsoft Access is a relational DBMS that has necessary features to develop and use for database application. It is a window-based DBMS, which is compatible with Microsoft WINDOWS operating System (WINDOWS 98/ME/NT/2000/XP). Microsoft Access allow user to easily manipulate and manage the database. Among the facilities supports by Microsoft Access are:-

1. Tables are where all the data is stored, which usually linked by relationships. The table consists of a set of rows representing records and columns representing fields (or attributes).
2. Queries are the way to extract data from the database. For instance a request to view, inserts, modify, analyze or display data.
3. Forms are the method used for input (enter data) and display of database data.
4. Reports are used to display nicely formatted data on paper.
5. Macros are sets of simple commands that execute sequences of database operations.
6. Modules are used to store general-purpose VB database program code.

The database hierarchy systems of Microsoft Access are as follows:-

1. Database File: The main file that encompasses the entire database and that is saved to hard-drive.
2. Table: A collection of data about a specific topic. There can be multiple tables in a database.
3. Field: Different categories within a table. Tables usually contain multiple fields.
4. Datatypes: Properties of each field, where the field has only one datatype.

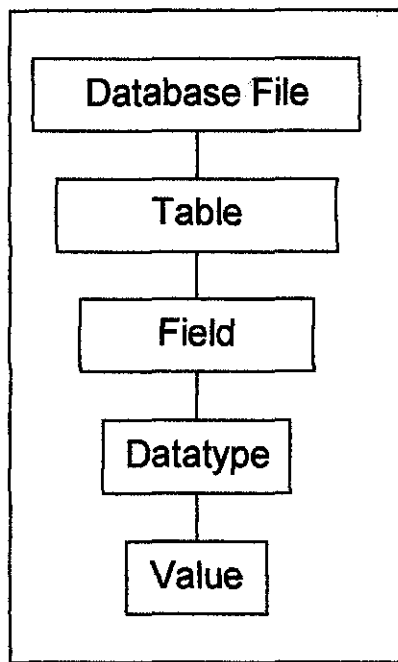


Figure 10: Database Hierarchy in Microsoft Access

The database storage is important for this system as it functions is to provide with the necessary and appropriate storage for the input records send by sensor circuitry. Thus, the RDBMS of Microsoft Access used to design the database application especially for the purpose of storing the surveillance records as the database can be interface with GUI application in order to display the information through the GUI display screen. Appropriate tables are design to suit with the input send by the circuit sensor.

#### 4.4 Graphical User Interface

Microsoft Visual Basic 6.0 is the software that designs the graphical user interface that shows the scene visualization to display input retrieve from the serial port. The Microsoft Visual Basic 6.0 version has evolved from the simplest programming language for Microsoft Windows to an exceedingly complex development environment. Microsoft Visual Basic 6.0 offers more flexibility to the developer to design the Human-Computer Interface via forms, that the forms

are created in a new window. VB allows event-driven programming, where the program are written to respond to an event, where the user's actions will cause an events and each events will then triggers a procedure that is associated with it.

Microsoft Visual Basic 6.0 that has been chosen to design the interface as the programming tool is capable to support for serial communications. Other advantage of using Microsoft Visual Basic 6.0 is that it has features that allow interfacing with other Microsoft Access applications.

Microsoft Visual Basic 6.0 is the software use to design the Graphical User Interface for the system. It is known as the best form of interfacing between the user and the system. The input retrieve from the serial port will be display in scene visualization on the user interface screen design using Microsoft Visual Basic 6.0. The software provides with many features that offers more flexibility to the developer to design the Interface via forms, that the forms are created in a new window.

#### **4.4.1 Microsoft Visual Basic 6.0**

Among the features provides by Microsoft Visual Basic 6.0 is the IDE Window that consists of:-

##### **1. Project window**

The window gives an overview of all modules that are contains in the application. Modules can be display by their types or in alphabetical order by clicking on the icon on the Project window's toolbar.

##### **2. Form Designer window**

It is use to design user interface application. Any application can contain multiple forms and number of form designers that can be open at the same time. Moreover, Microsoft Visual Basic 6.0 supports



additional designers such as *UserControl* and *UserDocument* designers.

### **3. Code window**

The window is use to write code that determines the behavior of forms and other objects in the application. Number of code windows is valid to be keep visible at one time, where each one displaying the code related to a form or more generally to a module in the application.

### **4. Toolbox window**

The window includes a set of objects that can be placed on a form or on another design. Microsoft Visual Basic 6.0 comes with a fixed set of controls, which is called as intrinsic controls such as the text box, picture box, text and others. But other Microsoft ActiveX controls can also be added into this window.

### **5. Properties window**

The window lists all the properties of the object that are currently being select and that permits modification.

### **6. Color Palette window**

This window is use to assign color to an object select by the designer.

### **7. Form Layout window**

The window shows how a given form will be displayed when the programs runs.

The main characteristics of the Graphical User Interface for the Vehicle Surveillance Alarm System are:-

1. The GUI will trigger the alarm system and send information to the user if any uncommon behaviors have been detected from the sensor circuitry.
2. It has a database linking with Microsoft Access to allow any transferring data.
3. The GUI allows user to view the data records to view the surveillance history.

#### 4.4.2 Intelligent Truck Tracking System User Interface

Intelligent Truck Tracking System is the integration of Vehicle Surveillance Alarm System with other modules of other research projects. Figure 11 shows the design board of the integrated Intelligent Truck Tracking System.

User interface screen design for Intelligent Truck Tracking System has been design to ensure that design of the system interface will achieve high level of usability. In order to fulfill the needs of the usability interface, the use of metaphors or images that exploit the user's prior knowledge by making interface objects seem like objects that the user is familiar with. Figure 11 illustrates the propose design board for the system GUI.

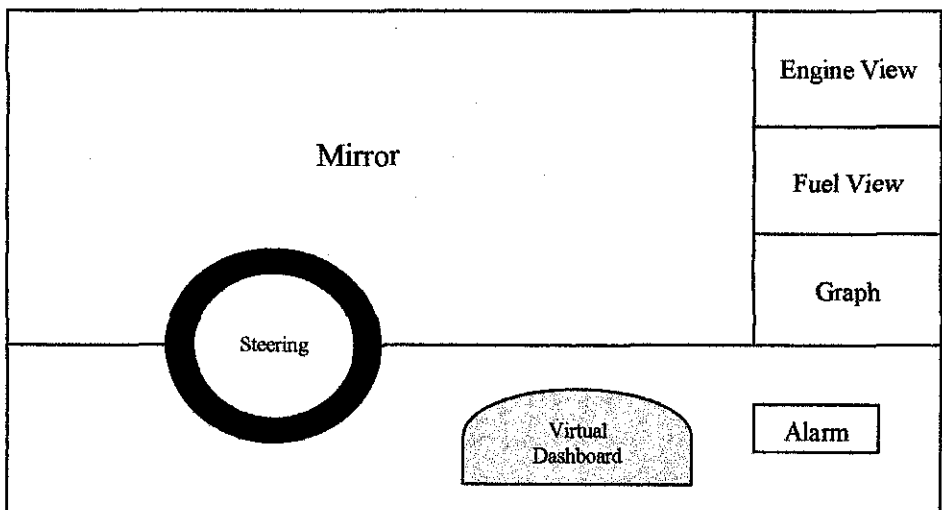


Figure 11: The Virtual Screen Graphical User Interface

Above GUI is the propose GUI for the Intelligent Truck Tracking System. It is a combination of several project modules to come out with one interface of the system. The descriptions about the screen interface are as follows:-

1. The GUI is the combination of the virtual truck screen and dashboard, virtual engine and fuel tank simulation and also the vehicle alarm system.
2. The virtual vehicle screen functions as a virtual view of the vehicle driver. The view can only portray the front image or view of the driver. If there is any accident occur and crash the vehicle screen will be showed on the virtual screen. The virtual screen can also function as collision detector.
3. Virtual dashboard functions as a real dashboard that displays the rpm meter, speed meter, heat indicator and fuel indicator.
4. The engine view is to show the simulation of the engine part of the vehicle. It show and indicate the current status of the engine part. If any engine problems and breakdown occur it will be indicated in the engine simulation.
5. Since the truck is actually the fuel tanker truck, the interface screen link with the fuel tank view. The fuel view will show the simulation of truck tanker condition.
6. Alarm indicator will be place on the GUI to indicate and acknowledge the vehicle driver of any uncommon behavior from the overall body and parts on the vehicle. The alarm indicator gives warning signs through sounds and advance notification.

## **4.5 Prototype Description**

### **4.5.1 Vehicle Alarm System Activity Diagram**

Refer to Appendix 4, the activity diagram of the Vehicle Alarm System is to illustrate on how a diagram is used to portray the sequential processing carried out by an object. The processes are:-

1. Once it is start up, it can be seen that the object enters a state where it initializes the system.
2. Then it moves to the next state where it reads the sensor data.
3. After checking the data, future progress is depends on its status, which is whether the data is normal or in alarm status. If the system status is in alarm, then the alarm will be trigger and activated.
4. Thus, the final action is that of updating the display of the alarm current status.

### **4.5.2 Target User Groups**

The Vehicle Alarm System prototype has been design for specific target user, which are the vehicle drivers. The system is applicable for various types of vehicles including trucks, cars, buses and other transportation. The prototype design has consider on the minimal knowledge areas of the user on computer usage, hence the prototype has been design in a simple and understandable approach and style that do not requires wide knowledge on computer.

### **4.5.3 Prototype User Interface**

The user interfaces for the Vehicle Surveillance Alarm System prototype have been kept simple and clear design concept. The objective of the interface design is to ensure that the requirements of designing the alarm

system for giving an advanced message to the user will be satisfied. This is to ensure that the system is ease to use even for users that does not have computer background.

The designing process of the interface is base on the graphical user interface design guidelines to ensure that a usability and user friendly design has been achieved for the Vehicle Surveillance Alarm System prototype interface. The designing process also has massive involvements from the user to ensure that the system achieve the requirements and the acceptance level of the user.

Referring to Figure 12, it displays the main interface of the Vehicle Surveillance Alarm System. The interface has been integrated with other module of virtual dashboard on the left side of the window. The vehicle Surveillance Alarm System (right side) interface features the simplicity and ease of use interface design. There are two command buttons that has been created on the center of the window, which represent for the temperature and fuel level sensor. Once, the temperature bar increased up to 70%, the alarm will trigger. The same goes when the fuel level has been decreasing below 70%, the alarm will give an early warning to the driver.

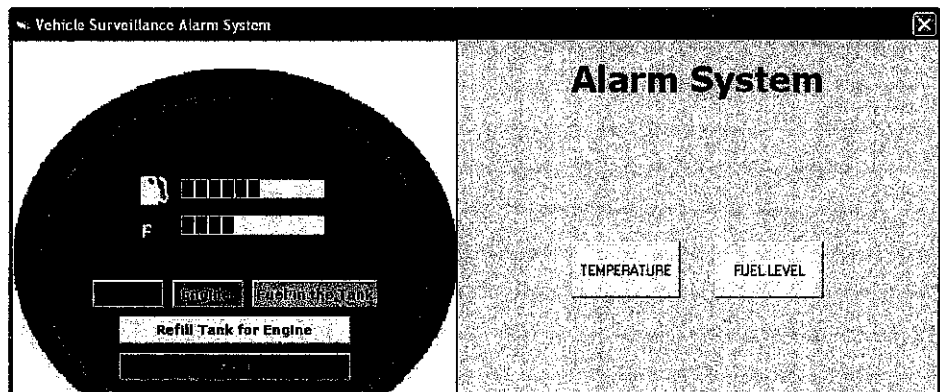


Figure 12: The Main Interface of the Vehicle Surveillance Alarm System

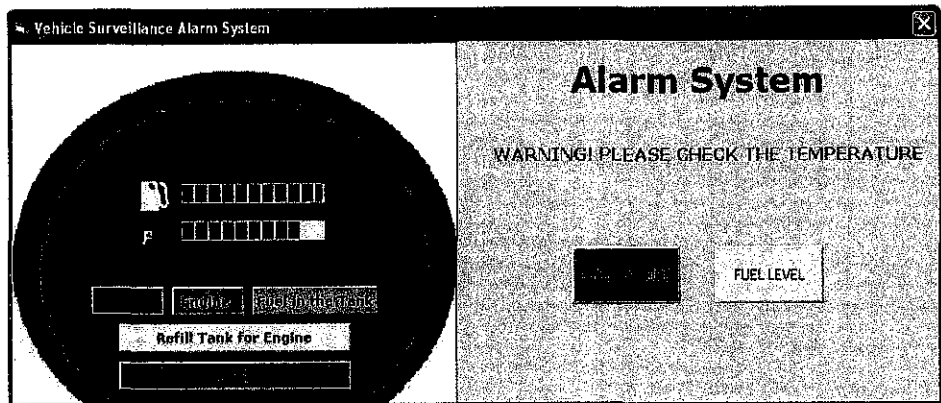


Figure 13: Warning notification on the main page for temperature

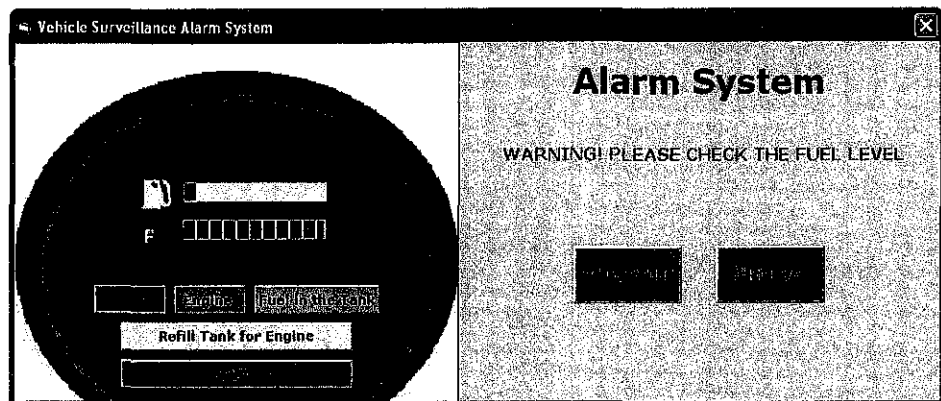


Figure 14: Warning notification on the main page for fuel level

Figure 13 and 14 shows the continuity of the main interface design. Once the alarm system has detected any uncommon behavior from both temperature and fuel level sensor, it will trigger the alarm by displaying the advanced warning notification and at the same time the alarm system will trigger the siren sound and change the button color into red in order to alert the driver. Advance warning notification and siren sound has been used as the tool to alert the driver because vehicle driver mostly obtain information through hearing and seeing.

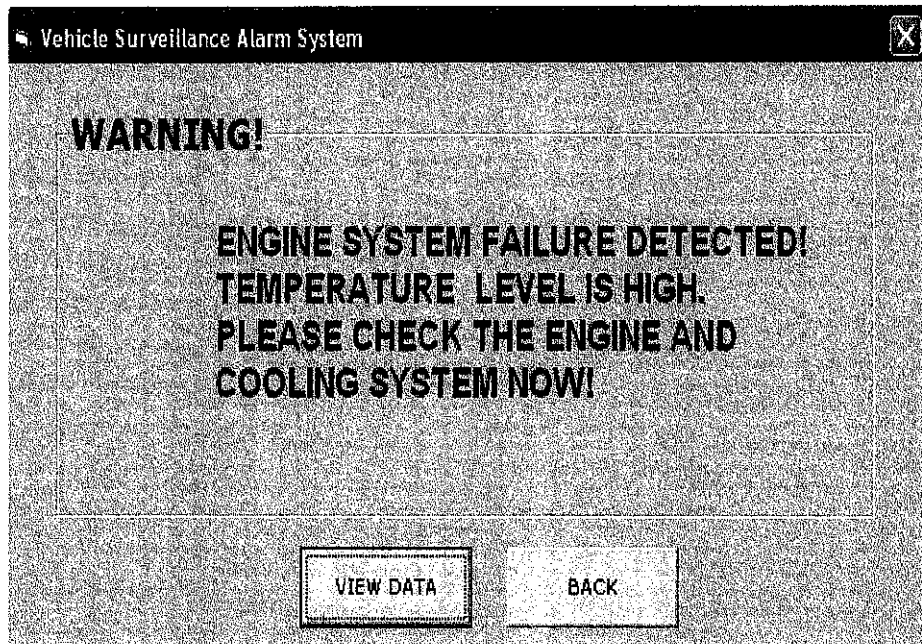
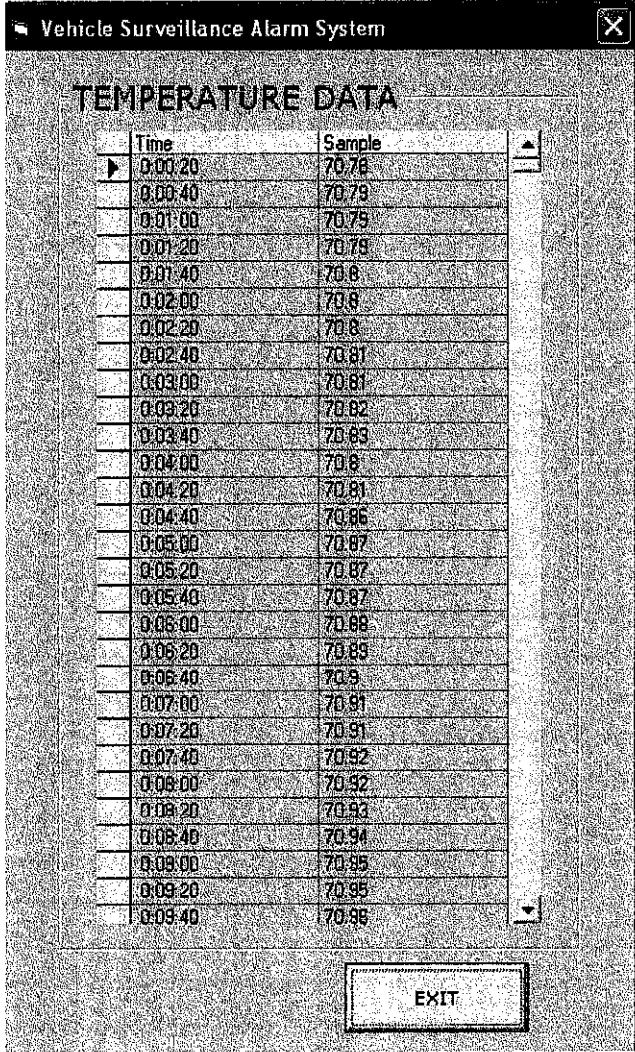


Figure 15: The Description of Warning Notification

Figure 15, shows the description of warning notification, which the continuation from the main page, when user has click on the temperature command button. This interface show the concept to display messages send by the system for an advance warning to user for checking the problem system that might encounter on the vehicle parts component. For example, the system has detected uncommon behavior from the temperature sensor, thus display the warning messages to the user to check the engine and cooling system since temperature level is related to the engine and cooling system of vehicle. There are two buttons at the bottom of the window. The left command button allows the user to view the data report of the temperature level in detail. The right button is the back button that initiates the action to view the previous main page.

Referring to Figure 16, it displays the third window of the alarm system. This window displays the data that display the detail time and

value of the sample. For example, Figure 16 shows the data for the temperature level. The interface displays the sample value for every twenty seconds time. This data is very useful for user to track back the surveillance record. The data record can be use to identify and measure the time of the vehicle parts component failure such as by the mechanic or by the user. There is an exit button place at the right bottom of the window to allow user to exit to the main page of Vehicle Surveillance Alarm System. The same concept of user interface is applied for the fuel level once the alarm system detects any uncommon behavior from the fuel tank.



Time	Sample
0:00:20	70.76
0:00:40	70.79
0:01:00	70.79
0:01:20	70.79
0:01:40	70.8
0:02:00	70.8
0:02:20	70.8
0:02:40	70.81
0:03:00	70.81
0:03:20	70.82
0:03:40	70.83
0:04:00	70.8
0:04:20	70.81
0:04:40	70.86
0:05:00	70.87
0:05:20	70.87
0:05:40	70.87
0:06:00	70.88
0:06:20	70.89
0:06:40	70.9
0:07:00	70.81
0:07:20	70.91
0:07:40	70.92
0:08:00	70.92
0:08:20	70.93
0:08:40	70.94
0:09:00	70.95
0:09:20	70.95
0:09:40	70.98

Figure 16: The View Data Interface



#### **4.5.4 Task Analysis**

The main tasks and the subtasks for the Vehicle Surveillance Alarm System are as below:

1. Vehicle Surveillance Alarm System trigger for temperature.
  - 1.1 Click on the Temperature command button.
  - 1.2 Display the warning notification for temperature.
  - 1.3 View data for the temperature level and the time.
  - 1.4 Click back command button to return to the main page.
  
2. Vehicle Surveillance Alarm System trigger for fuel level.
  - 2.1 Click on the Fuel Level command button.
  - 2.2 Display the warning notification for fuel level.
  - 2.3 View data for the fuel level and the time.
  - 2.4 Click back command button to return to the main page.
  
3. To exit from the Vehicle Surveillance Alarm System.
  - 3.1 Click on the exit command button.

#### **4.6 Problems Face During Prototype Design**

The prototype has been design to satisfy the minimum or basic requirement of an alarm system that comply to the Vehicle Alarm System research project. In order to come out with the prototype design, there are several problems have been faced. To design an effective system, it is appropriate to provide both software and hardware application in order to come out and present with the real view of an alarm system mechanism. The hardware application is important to show the flow from the start point, where the sensor sense or detect the behavior of the vehicle components and send the data to the pc from the sensor circuitry through the serial communication port. From the serial port, software application is needed to display the data received from the hardware into more appropriate and

reasonable graphical user interface. Due, to lack of resources, the prototype design could not provide with hardware application, thus data could not be received directly from the sensor, where the data should be dynamic. Therefore, the author has come out with the solution to use static data instead of using dynamic data. The static data that use for designing the prototype is the same as the real output produce by the sensor, thus accomplish the Vehicle Alarm System prototype design. The static data that use for designing the prototype will be the temperature data and fuel level data.

#### **4.7 Alarm System Future Enhancement**

The Vehicle Surveillance Alarm System has a good potential to be enhance more since it can helps to contribute for vehicle accident and fatalities prevention. However, it will be a challenge on improving vehicles security and safety features. The alarm system is used as driver assistance, where the driver assistance system will play an important role in the next generation of producing intelligent vehicles. To add more value on the alarm system, some new applications like "Blind spot detection" or "lane departure warning" will be advantages for the system. Moreover, future assistance system, like a "lane change assistant" or a "steering assistant", will support the driver in difficult traffic situations, which is most commonly happens on Malaysia road traffic. The car vision, based on the capturing and processing of video images, can be as one key technology for driver assistance system, because it allows for necessary tasks like "lane marking detection", "traffic sign recognition", or "driver recognition" that can complete the whole alarm system for intelligent vehicles. However, these studies are contributing for developing the Intelligent Transportation System for future usage. Perhaps, the current research of Vehicle Surveillance Alarm System can be enhance more by studying and identifying the appropriate and best location to display the user interface inside the vehicle. This is to ensure that the user can view and use the system in most appropriate and efficient way.

## **CHAPTER 5**

### **CONCLUSIONS AND RECOMMENDATION**

#### **5. CONCLUSION**

Vehicle alarm system can be one feature to increase the security and safety level of vehicle. Many research has been done to improve vehicle security and safety features to reduce the vehicles accidents and fatalities that been increasing from year to year. Manufacturing company has started the invention to produce alarm system that lead to the invention on intelligent vehicle.

Therefore, the goal of producing the Vehicle Surveillance Alarm System is to provide an intelligent element to vehicle and increase the level of security and safety to be implemented for the vehicle. This project research helps to reveal some technologies that can contribute in order to ensure a successful product will be produce.

The Vehicle Surveillance Alarm System concept design is based on the Real-Time Vehicle Surveillance Alarm System design. The project has focus on the design of the application software that involves the three vital phases which are the serial interface, the database storage and GUI interface.

The Vehicle Surveillance project research starts from receiving the input from the input data interface through the serial port to the database application and display the output on the GUI interface screen. Simpler meaning, the research focus begin

from the serial interface that involves with connecting the microcontroller circuitry, which is the sensor circuitry to the software application at the computer. In order to accomplish each level, it is important to ensure that the connection between the circuit sensor and the application program can be establish through RS-232 serial port interface by adding the Microsoft Comm Control 6.0 at the Microsoft Visual Basic 6.0 software. The use of Microsoft Visual Basic 6.0 helps to give solution in order to ensure connection between the circuit sensor and the application program can be establish through RS-232 serial port interface by adding the Microsoft Comm Control 6.0 at the Microsoft Visual Basic 6.0 component.

For the database storage design, an appropriate database has been identify which is the Microsoft Access that can be integrate with Microsoft Visual Basic 6.0 that being use for designing the prototype interface design. Moreover, Microsoft Access is RDBMS packages that easy to install at the client side computer, since the hardware is connected to the computer central processing unit. Besides that, Microsoft Visual Basic 6.0 can interface with Microsoft Access in order to establish the database connection to the prototype interface design. The database connection is important as it allows activities of retrieving and stored the input send by the circuit sensor and transmitting back appropriate feedbacks of action to be taken.

For the design part of the Vehicle Surveillance Alarm System prototype interface, the author has use Microsoft Visual Basic 6.0 because the software is most suitable to be use to design prototype interface. The designing tools provide by the software ensure that the designing of prototype will ensure that the prototype can be produce in faster to meet the project timeframe

The author also include the development of the interface design that base on the GUI design principles and guideline to ensure that a friendly system that enhances the usability of the GUI screen interface will be produce to ensure that the system

can be accepted and easy to understand by the user even for the not computer literate user.

Problems has encountered during the development phase of the prototype interface. The system could not provide with the real time system in order to demonstrate the real alarm system flow. To solves the problem static data has been used to replace the usage of dynamic data. The prototype design thus cannot show how the serial communication works as a medium of transferring data to the application software. Hence, the prototype interface design shows how data stored at the database display at the screen display, where the system will trigger the alarm by referring to the data stored in the database.

The project research is expected to meet the requirements and the objective of developing the Vehicle Surveillance Alarm System. This will then help to contribute to reduce the number of vehicles fatalities and accidents by increasing the level of security and safety by having an advanced warning message to the user to encounter problems of vehicle parts component that could not be figure out by the driver.

Furthermore, the best recommendation or suggestion for the current research of Vehicle Surveillance Alarm System is that the system can be enhance more by studying and identifying the appropriate and best location to display the user interface inside the vehicle. This is to ensure that the user can view and use the system in most appropriate and efficient way at best place.

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## **APPENDICES**

**Appendix 1: DB25 Parellel (RS232) Port**

**Appendix 2: DB9 Serial (RS232) Port**

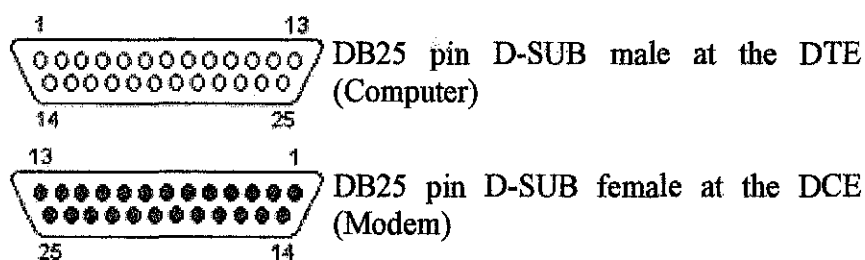
**Appendix 3: Steps for Adding the Microsoft Comm Control 6.0 to Visual Basic**

**Appendix 4: Activity Diagram of the Vehicle Surveillance Alarm System**

**Appendix 5: Visual Basic Source Code**

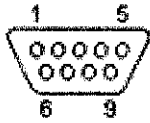


## Appendix 1: DB25 Parallel (RS232) Port



Pin	Name	Direction	Description
1	GND		Shield Ground
2	TXD	—»	Transmit Data
3	RXD	«—	Receive Data
4	RTS	—»	Request to Send
5	CTS	«—	Clear to Send
6	DSR	«—	Data Set Ready
7	GND		System Ground
8	CD	«—	Carrier Detect
9	-	-	RESERVED
10	-	-	RESERVED
11	STF	—»	Select Transmit Channel
12	S.CD	«—	Secondary Carrier Detect
13	S.CTS	«—	Secondary Clear to Send
14	S.TXD	—»	Secondary Transmit Data
15	TCK	«—	Transmission Signal Element Timing
16	S.RXD	«—	Secondary Receive Data
17	RCK	«—	Receiver Signal Element Timing
18	LL	—»	Local Loop Control
19	S.RTS	—»	Secondary Request to Send
20	DTR	—»	Data Terminal Ready
21	RL	—»	Remote Loop Control
22	RI	«—	Ring Indicator
23	DSR	—»	Data Signal Rate Selector
24	XCK	—»	Transmit Signal Element Timing
25	TI	«—	Test Indicator

## Appendix 2: DB9 Serial (RS232) Port



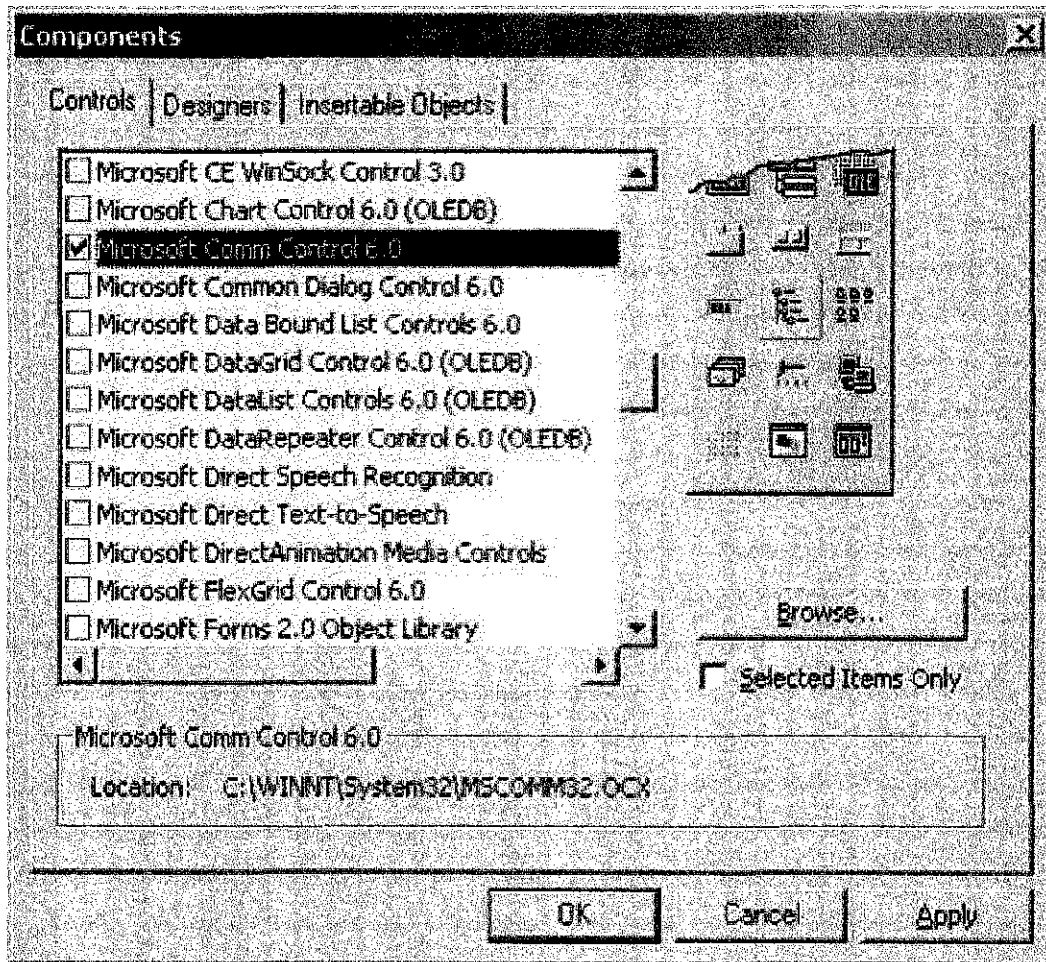
DB9 pin D-SUB male

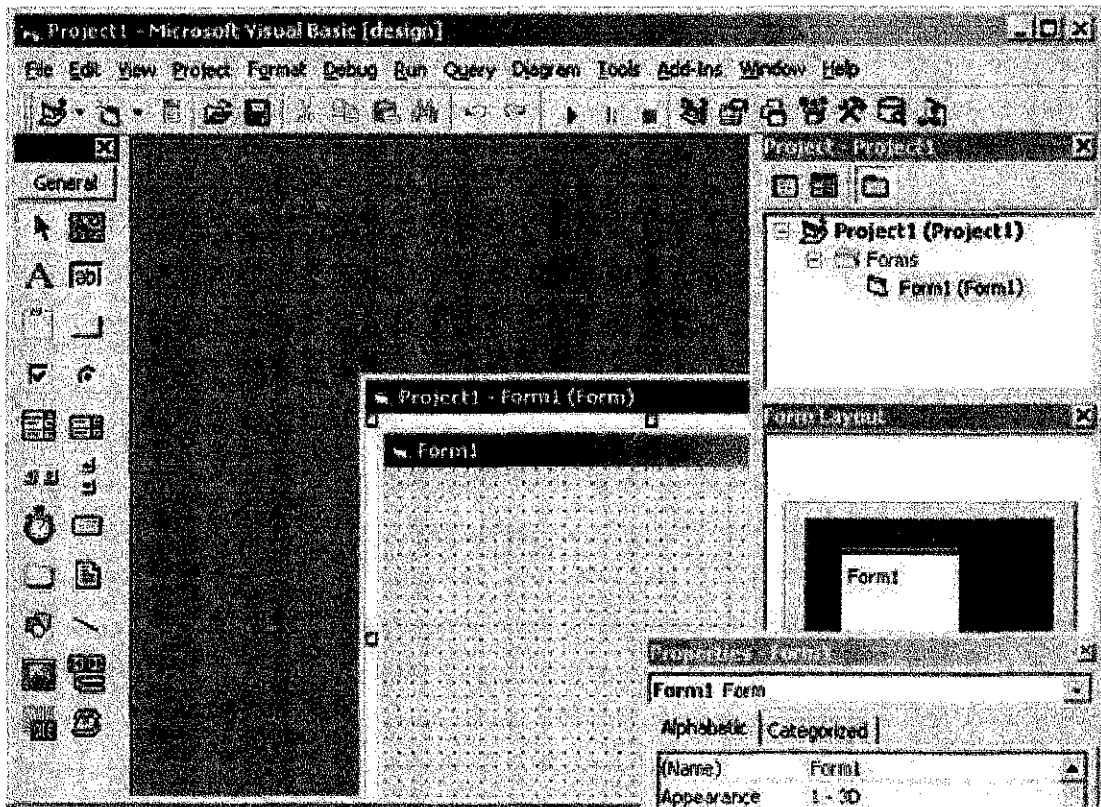
Pin	Name	Direction	Description
1	CD	«—	Carrier Detect
2	RXD	«—	Receive Data
3	TXD	—»	Transmit Data
4	DTR	—»	Data Terminal Ready
5	GND		System Ground
6	DSR	«—	Data Set Ready
7	RTS	—»	Request to Send
8	CTS	«—	Clear to Send
9	RI	«—	Ring Indicator

### Appendix 3: Steps for Adding the Microsoft Comm Control 6.0 to Visual Basic

The steps for adding the Microsoft Comm Control 6.0 component into Microsoft Visual Basic. Follow these steps in order:

1. Create a new project.
2. Go into the Project menu, select components, and add the Microsoft Comm Control 6.0 to the project. You should now see a telephone icon in the component window. Place two text boxes on the form.





3. Place a label above each text box.
4. Change one of the label's captions to Received Data and the other to Data To Transmit.
5. Rename the text box below the Received Data label to ReceivedDataTextBox.
6. Rename the text box below the Data To Transmit label to DataToTransmitTextBox.
7. Create a command button on the form and change its caption to Transmit.
8. Select the Comm control and place it on the form.
9. Set the Comm Port property to the port you are using for communications on the PC.
10. Set the settings property to 19200, n, 8, 1.
11. Set the Rthreshold property to 1. This will cause an OnComm event any time a character is received on the serial port.
12. Fill in the form's code as shown:

```

Private Sub Command1_Click()
    MSComm1.Output = DataToTransmitTextBox.Text
End Sub

Private Sub Form_Load()
    MSComm1.PortOpen = True
End Sub

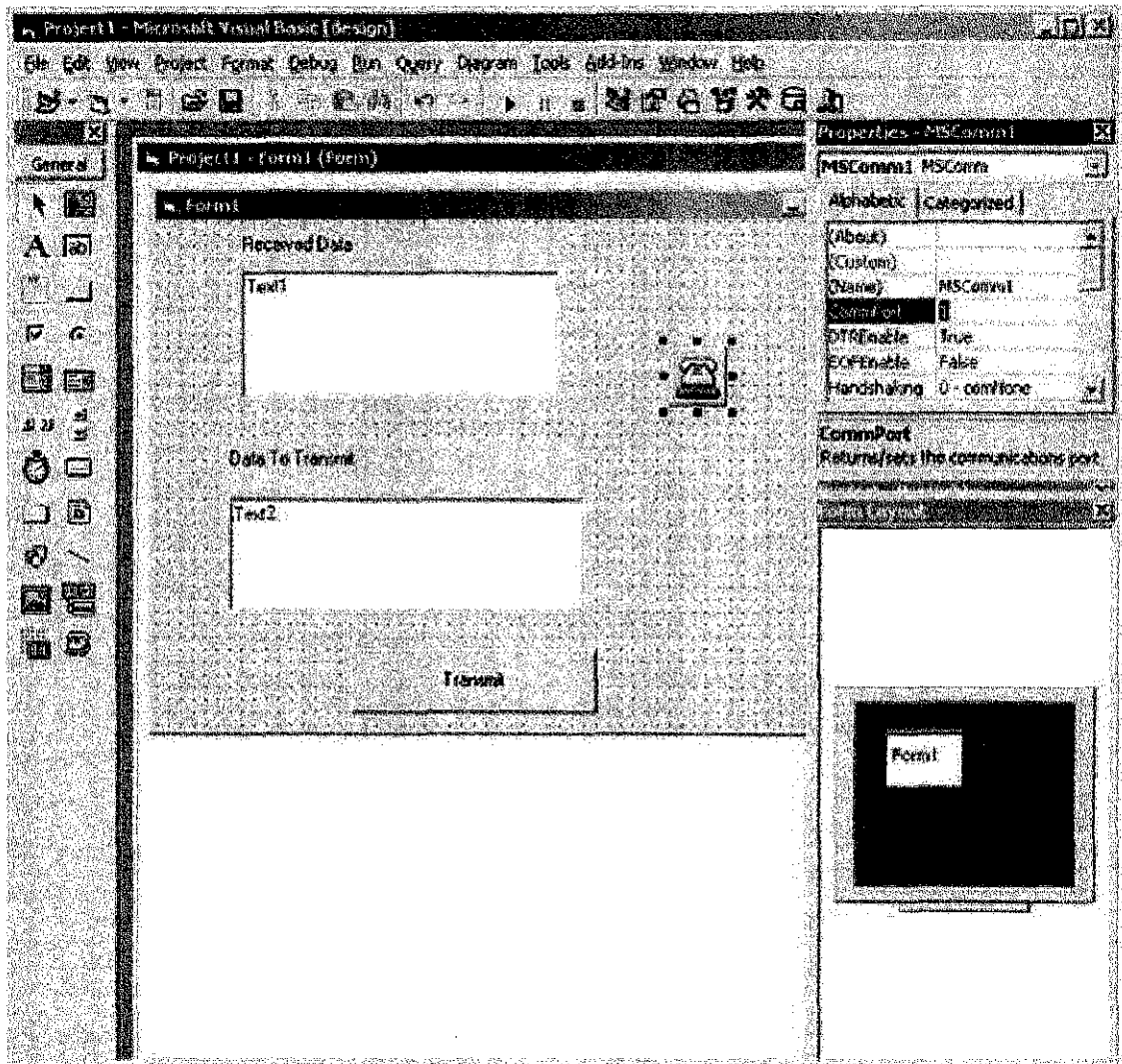
```

```

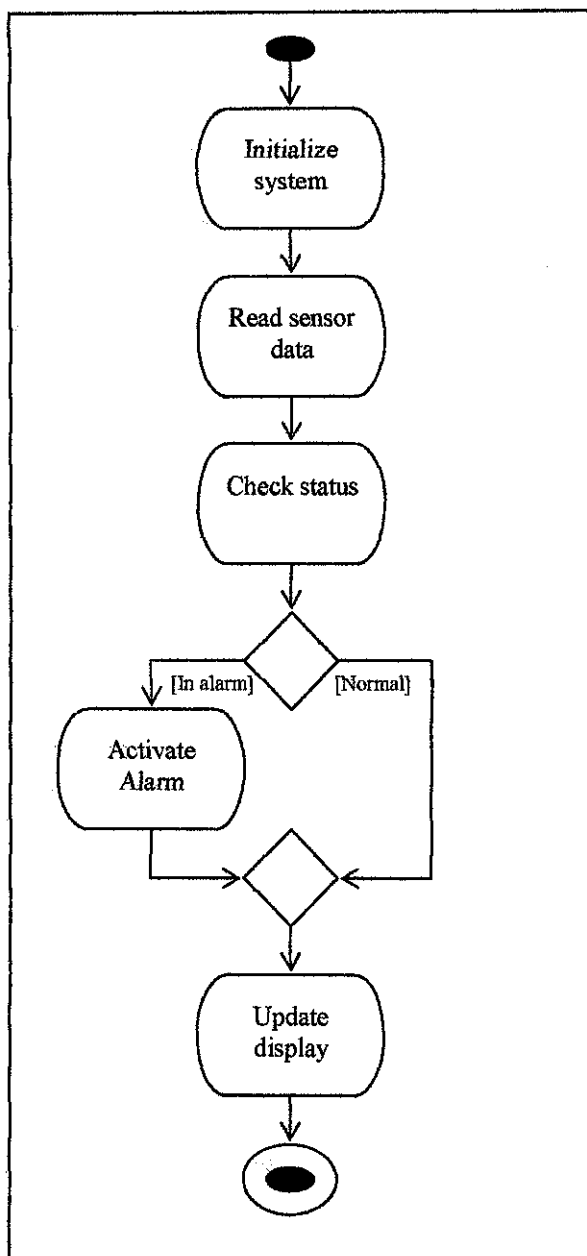
Private Sub MSCComm1_OnComm()
    Select Case MSCComm1.CommEvent
    Case comEvReceive
        ReceivedDataTextBox.Text = MSCComm1.Input
    Case comEvSend
        ' do nothing here for now
    End Select
End Sub

```

When all done, the PC project should look like:



#### Appendix 4: Activity Diagram of the Vehicle Surveillance Alarm System



## Appendix 5: Visual Basic Source Code

---

---

' **PROJECT**

---

---

' **NAME** : AIDA FAZLINA BINTI ZAINAL ABEDIN  
' **PROGRAM** : INFORMATION SYSTEM  
' **SUPERVISOR** : MR HELMI MD RAIS  
' **LATEST DATE** : 08 JUNE 2004

---

---

### FORMS

#### frmVAS

Option Explicit

Public SwitchVal As Boolean

Private Running As Boolean

Private Value As Long

Private Direction As Boolean

Dim first As Boolean

Private Sub Command1\_Click()

Running = Not Running

Timer7.Enabled = Running

If Running Then

Command1.Caption = "Stop"

Else

Command1.Caption = "Start"

End If

Timer7.Enabled = True

Timer7.Interval = 1000

End

End Sub

Private Sub Command2\_Click()

frmGraph.Show

End Sub

Private Sub Command3\_Click()

End

End Sub

Private Sub Command5\_Click()

frmEngine.Show

End Sub

Private Sub Command4\_Click()

ProgressBar2.Value = 100

End Sub

```
Private Sub Timer15_Timer()  
    If Label3.Visible = True Then  
        Label3.Visible = False  
    Else  
        Label3.Visible = True  
    End If  
End Sub
```

```
Private Sub Timer16_Timer()  
    If Label4.Visible = True Then  
        Label3.Visible = False  
    Else  
        Label4.Visible = True  
    End If  
End Sub
```

```
Private Sub Timer7_Timer()  
    If first Then  
        first = False  
    End If  
    Exit Sub  
End Sub
```

```
Private Sub Timer10_Timer()  
    ProgressBar2.Value = ProgressBar2.Value + 1  
    If ProgressBar2 = 100 Then  
        Timer4.Enabled = True  
    End If  
    If ProgressBar2 = 100 Then  
        Timer10.Enabled = False  
        Timer11.Enabled = True  
    End If  
End Sub
```

```
Private Sub Timer11_Timer()  
    ProgressBar3.Value = ProgressBar3.Value + 1  
    If ProgressBar2 = 100 Then  
        Timer12.Enabled = True  
        Timer11.Enabled = False  
    End If  
End Sub
```

```
Private Sub Timer12_Timer()  
    ProgressBar2.Value = ProgressBar2.Value - 1  
    If ProgressBar2.Value = 1 Then  
        Timer12.Enabled = False  
    End If  
End Sub
```

```
Private Sub Timer8_Timer()  
    ProgressBar1.Value = ProgressBar1.Value + 1  
    If ProgressBar1 = 100 Then  
        Timer1.Enabled = True  
    End If  
    If ProgressBar1 = 100 Then
```



```

    Timer8.Enabled = False
End If
End Sub

```

```

Private Sub cmdTemperature_Click()
    frmWarnTemperature.Show
    Timer18.Interval = 1
    Timer17.Interval = 0
End Sub

```

```

Private Sub cmdFuelLevel_Click()
    frmWarnFuelLevel.Show
    Timer20.Interval = 1
    Timer19.Interval = 0
End Sub

```

```

Private Sub Form_Load()
    first = True
    Timer7.Enabled = False
End Sub

```

```

Private Sub Timer1_Timer()

```

```

    Dim dbTemperature As Database
    Dim Temperature As Recordset

```

```

    Set dbTemperature = OpenDatabase("C:\Vehicle Surveillance Alarm
System\Vehicle_Alarm_System.mdb")
    Set Temperature =
        dbTemperature.OpenRecordset("Temperature", dbOpenDynaset)
    Data1.Recordset.FindFirst "Sample>=73.0"
    If Data1.Recordset.NoMatch = False Then
        MsgBox "The engine system is stable!", vbOKOnly, "ALERT !"
    Else
        Timer2.Enabled = True
    End If
End Sub

```

```

Private Sub Timer4_Timer()

```

```

    Dim dbFuel As Database
    Dim Fuel As Recordset

```

```

    Set dbFuel = OpenDatabase("C:\Vehicle Surveillance Alarm System\Vehicle_Alarm_System.mdb")
    Set Fuel =
        dbFuel.OpenRecordset("Fuel_Level", dbOpenDynaset)
    Data2.Recordset.FindFirst "Sample<=119.0"
    If Data2.Recordset.NoMatch = False Then
        Timer3.Enabled = True
    Else
        MsgBox "The fuel level is still alright !", vbOKOnly, "ALERT !"
    End If
End Sub

```

```

Private Sub Timer2_Timer()

```

```

If Label1.Visible = True Then
    Label1.Visible = False
Else
    Label1.Visible = True
End If
End Sub

```

```

Private Sub Timer9_Timer()
    If Label4.Visible = True Then
        Label1.Visible = False
    Else
        Label4.Visible = True
    End If
End Sub

```

```

Function PlaySound()
    Timer5.Enabled = True
End Function

```

```

Private Sub Timer5_Timer()
    sndPlaySound "c:\Vehicle Surveillance Alarm System\sounds-high-low.wav", 1
End Sub

```

```

Private Sub Timer6_Timer()
    Timer5.Enabled = False
End Sub

```

```

Private Sub Timer13_Timer()
    sndPlaySound "c:\Vehicle Surveillance Alarm System\sounds-high-low.wav", 1
End Sub

```

```

Private Sub Timer14_Timer()
    Timer13.Enabled = False
End Sub

```

```

Private Sub Timer18_Timer()
    If TextBlink(SwitchVal) = True Then
        Let cmdTemperature.BackColor = &HFF&
    Else
        Let cmdTemperature.BackColor = &HE0E0E0
    End If
End Sub

```

```

Private Sub Timer17_Timer()
    If TextBlink(SwitchVal) = True Then
        Let cmdTemperature.BackColor = &HE0E0E0
    Else
        Let cmdTemperature.BackColor = &HFF&
    End If
End Sub

```

```

Public Function TextBlink(Switch As Boolean) As Boolean
    Select Case Switch
        Case True

```

```

        TextBlink = True
        SwitchVal = False
    End Select
End Function

Private Sub Timer19_Timer()
    If TextBlink(SwitchVal) = True Then
        Let cmdFuelLevel.BackColor = &HE0E0E0
    Else
        Let cmdFuelLevel.BackColor = &HFF&
    End If
End Sub

```

```

Private Sub Timer20_Timer()
    If TextBlink(SwitchVal) = True Then
        Let cmdFuelLevel.BackColor = &HFF&
    Else
        Let cmdFuelLevel.BackColor = &HE0E0E0
    End If
End Sub

```

### **frmWarnFuelLevel**

```

Private Sub cmdBack_Click()
    frmVAS.Show
    Unload Me
End Sub

```

```

Private Sub cmdView_Click()
    frmFuelLevelData.Show
    Unload Me
End Sub

```

### **frmWarnTemperature**

```

Private Sub cmdBack_Click()
    frmVAS.Show
    Unload Me
End Sub

```

```

Private Sub cmdView_Click()
    frmTemperatureData.Show
    Unload Me
End Sub

```

## **MODULES**

### **Sound(Sound.bas)**

```

Declare Function sndPlaySound Lib "winmm.dll" Alias "sndPlaySoundA" _
    (ByVal lpszSoundName As String, ByVal uFlags As Long) As Long

```