

## **CHAPTER ONE**

### **INTRODUCTION**

#### **1.1 BACKGROUND OF THE STUDY**

Traditionally, high control in home and office environments takes place through switches (on/off), deals and sliders (dimmers) and sometimes motion sensors. These controls can be incorporated in the built environment such as walls, or attached to lights that people place themselves (desk lamps, bed side lights). This often leads to a jumble of controls each with their own location, interaction style, and focus.

This project is a demonstration of how a PC can be used as a control signal generation subsystem capable of generating programmable control signals for power equipment. Early studies reveal that using PC for power management was often found to be up to 25% more than energy star compliant methods. However, recent assessments have found higher rates, and was estimated that for power management.

Switching control is a good replacement for conventional pneumatic or Electro chemical high voltage AC control. This equipment is capable of not only control but energy management and system diagnostic functions. The PC control inherently has more accurate control because it reduces maintenance and recalibration problems common with pneumatic and mechanical systems.

It offers other unique advantages like subsystem coordination, optimum start, diversity analysis and retrofit identification.

This design begins with the fact that a computer is needed to light bulbs of high AC rating. This immediately suggests that an interface of the PC is needed to handle the mismatch in voltage and currents between the PC and bulbs.

Secondly the control data from the PC program are logic levels in serial format and at high frequency. This again means that the interface should understand the protocol of communication and convert it to the necessary parallel control signal. Due to lack of resources, the project will not be real but simulated. This system will represent for more than just manual on/off control. The system comprises of two major components, output device, and input device. Output devices work behind the scenes to control the lights by switching them off or on. Input devices are the switcher i.e. the button or sensors.

## **1.2 PROBLEM STATEMENT**

- ❖ No prior information whether a bulb is dead or not
- ❖ There is always a problem of one or two poles using one switch. That is each pole with a switch which could amount to lots of expenses. Each pole with their own switch and location.
- ❖ It consumes one's time in the sense that one will move from one pole to another. Just to put one or off the light.

## **1.3 OBJECTIVES OF STUDY**

This professional documentation focuses on using a serial interface hardware built on microcontroller and max 232 serial converters. To ensure that the high negative -15 volts and + 15 volts of the serial RS232 port is converted and programmed to suit the CPC logic levels. The system is responsible for controlling,

energy management and system diagnostic functions. Tracking of all lighting activities, especially bulbs. In a place where prepaid meter is in use, it could help reduce the cost.

#### **1.4 SIGNIFICANCE OF STUDY**

This system is important considering the fact that only a push of a button can switch off or on the light connected within the system. With this system, one can easily be on his/her bed and switch off or on the lights.

The system is safe therefore children can also switch off or on the light when their parents or guardians are not close. The system is very necessary in the sense that it gives you what you want at any needed time. The system also keepstrack of all activities (bulb).

#### **1.5 SCOPE OF STUDY**

The research will focus on creating a computerized system that will switch on or off light on the street and equally control the power aspect.

The research will also focus on light bit microcontroller issues discreet digital electronics in appliance control. Intel controllers that can complete application are typically relegated to switches and times are also discussed. It will be a system that maximizes user efficiency and user convenience.

#### **1.6 LIMITATION OF STUDY**

One of the major setbacks of this work is finance. Due to lack of finance, one could not bring the system to life. Inadequate electricity also contributed to the setback of this work.

## **1.7 DEFINITION OF TERMS**

**Electrochemical:** describe a mechanical device that is powered or controlled by electricity. Relating machines powered by electricity.

**Pneumatic:** the branch of physics with the mechanical properties of air and other gases.

**Retrofit Identification:** To modify something such as a machine or a building by adding newly developed parts or devices that were not available where the machine or building was made.

**Diversity analysis:** A variety of something such as opinion, colour, or style.

## CHAPTER TWO

### LITERATURE REVIEW

#### 2.1 INTRODUCTION

The objective of this chapter is to provide an impression of the kinds and scope of the relevant existing research study. In 1977-78 Crisp et al. (36-37) reported a preliminary study on automated artificial light control in accordance with variation of daylight. The purpose was to supplement the available daylight in the task area with just enough electric light to meet the design level. The idea of computerized control of artificial light intended for daylight harvesting was primarily introduced in 1987 by Crab et al. (38-39). They developed a self-commissioning adaptive algorithm well enough for the real-time prediction of natural light levels using the external vertical plane luminance measurements. This attempt of the authors could be viewed as a framework for the model-based lighting control scheme.

Rubinstein et al. (4) presented a first documented demonstration of the close-loop photocell control system that could correctly compensate for both, changes in daylight as well as human depreciation of electric lighting system. A novel two-part photocell and electronic dimming ballast capable of providing a dimming range from 100% to 70% were employed in the study. Their experimental results (40) show a lighting energy saving of approximately 50% due to integrated operation of daylighting, human maintenance, and scheduling.

Benefits of hybridization between simulation and machine learning can be advantageously used for the purpose of light control. The reason is that such a controller would progressively learn to adapt to building and environmental

characteristics (29). Caullenin and moral (41-42) implemented architecture of a lighting controller using GA which could integrate itself into an advanced building control system according to user wisher. In their process, they compared three controllers, a manual control system, an automatic controller without user adaptation, and an automatic controller with user adaptation.

The main benefit of automatic controllers was the reduction of total energy consumption with 26% energy savings compared with the reference case of manual control.

In a simulation work, seongychary (43) established that analytical approaches assisted by inductive learning aids the daylight responsive lighting control strategy. The author (43) used multiple hybrid controllers to accomplish four control goals mainly enriching the informational reporter of systems control operations for lighting (by inclusion of performance indicators for glove and solar gain), reducing the number of sensing units necessary and capturing the states of the building's visual performance indicators in real time, enhancing the accuracy of predictions necessary for the identification of the best control option, and maximizing the searches in the lighting system control state space within a limited time. The resulting hybrid prototype control system hybrid intelligence for system state transition operation (HISSTO) has been evaluated by the author (43) to conform to specified visual performance indicators such as average luminance and uniformity. However, the energy conservation aspect is not investigated in the research (43). This seamless prototype controller using neural network was tested and implemented through a web-based interface with a view to minimize data dependency and sensor dependency (43). Yet, it is found to be a complex strategy involving simulation assisted ANN based control of integrated schemes.

Kurian et al. (44) shows a possibility of using a model based artificial light control technology. An attempt has been made by the same author in (10) for applying simulation assisted computational model for adaptive predictive control in a daylight artificial integrated scheme for energy saving visual comfort, and thermal comfort. For maximizing energy saving whole optimizing the performance and the quality of the visual environment the author proposed an integrated scheme comprising of (a) a system identification approach for lighting control strategy, (b) a fuzzy logic based window blind controller to reduce glare, increase uniformity and thermal comfort, (c) an adoptive predictive control scheme for the dimming of artificial light. In addition, the scheme was a designed as to coordinate and control the automated electric lights as the window blind systems per user presence and user wishers. The author's simulation result (10) carried out for tropical climates of manipal, south India using test reference year (TRY) 2005 showed that ANFIS light dimming with the fuzzy blind controller designed only for glare control showed an increased annual energy saving of 35% to 60% according to window orientation.

However, authors approach involved only simulation environment and training the controller with offline data simulated from radiance loyalty software. Therefore, the possibilities of the controller being effective under the varying performance requirements due to the parameter variations and disturbances are limited. The authors (100 recommended that real time adoptive predictive light control scheme modeled with real time measurements, online performance predictors and design procedures would yield robust controller performance.

The potential of day lighting in the tropical regions has been recognized since the 1960s (45). Before the day lighting is to be utilized as a building-environment

technology it is very important to consider the need for a daylight and energy performance characteristics of the system and building (46). Nevertheless, reliable prediction of daylight availability in indoor environments via computational simulation, it requires a reassembly detailed exterior illuminance model. Exterior daylight availability in terms of global and diffuse illuminance value is absolutely essential while evaluating its energy saving potential in a light artificial integrated scheme and also in many interior daylight modeling and simulation tools. Most fundamental daylight and solar research studies conducted by the corditects and engineers are based on the data taken from the meteorology stations. Exterior horizontal and vertical daylight illuminance in particular, are recorded only at a relatively few weather stations. Fortunately metrological offices world-wide measure and archive exterior horizontal global and diffuse irradiation data.

These exterior irradiance data's may be most advantageously employed for the prediction of horizontal and vertical daylight illuminance using suitable daylight illuminance mathematical models (47-52).

The concept is, using the established daylight illuminance models if humongous efficacy which is the ratio of illuminance to irradiance is computed, the measured irradiance values could be converted into illminance values which in turn could be used as an input for the daylight simulation tool to calculate the daylight availability (53-54) with the monthly mean hourly climate data, the assessment of the daylight illuminance on a horizontal window and vertical windows facing four cardinal directions (north, east, south and west) is worked out using Perez et al, inclined irradiance model (48) hereafter Perez model.



## 2.2 CATEGORIES OF SWITCHES

Switch can be said to be a small lever, handle or other device for putting or turning an electric current on or off. Categories of switches are:

**2.2.1 MECHANICAL SWITCHES (HAND SWITCHES):** There are switches designed to be operated by a person. They are manufactured in several varieties.

i. **Pushbutton switch:** A pushbutton is a mechanical switch defined by the method used to activate the switch prior to the toggle switches a popular design was the pushbutton switch comprises of a depressed button oriented below or beside a raised button. Pushing the raised button opens or closes the contacts while popping out the previously depressed button so the process can be reversed. The pushbutton switches are so called due to their activation method, which usually in the form of a phinger that when pushed down opens or closes the switch. The configurations of these mechanical switches can be single pole single throw (SPST), single-pole double-throw (SPDT), double pole single throw (DPST), double-pole double-throw (DPDT) or solid state. Most push button switches have an internal spring mechanism returning the button to its 'out' 'or' no" until the button is pulled back out.

ii. **Toggle switches:** Toggle switches are actuated by a level in one or two positions. The common light switch used in household wiring is an example of a toggle switch. Most toggle switches will come to rest in any of other level positions, while others have internal returning spring mechanism. This allows for momentary operation. In a toggle switch the toggle swings to make or break

circuit. It includes maintained contact and momentary contact types. Light switches and the caps lock key on a computer keyboard are examples of toggle switch applications.

**iii. Rotary switches:** Rotary switches move in a circle, and stop in several positions along its range. Rotary switches have contacts that are arranged in a full or partial circle, which means the mechanism that selects the contact must be turned. Rotary switches, which may be manual or automatic, are used in such application as automobile distributions or ignition switch.

**iv. Snap acting switches:** Snap action Switch is a mechanical switch that produces a very rapid transfer of contact from switch that produces a very rapid transfer of contact from one position to another. They are useful in situations that requires a fast opening or closing of a circuit, such as a mouse button or appliance setting. Snap action switches are designed to quickly move their contacts from one location to another. Mouse button and appliance setting use such switches.

**v. Key lock switches:** Key lock switches have of using key as the means of activation. The key is turned in a circle, and stop in several positions in its range. At one of the several positions, the switches are triggered.

**vi. Selector switch:** Selector switches are actuated with a rotary knob or lever of some sort to select one or more positions. Like the toggle switch, selector

switches can either in any of their position or certain spring return mechanisms for momentary operation.

**vii. Joystick switch:** A joystick switch is actuated level for to move in more one axis of motion. One or more of several switch contact mechanisms are actuated depending on which way the level is pushed, and sometimes by low far it is pushed. The circle and-dot notation on the switch symbol represents the direction of joystick level motion required to actuate the contact. Joystick hand switches are commonly used for came and robot control.

**viii. Rocker Switches:** they are electric switches that are activated by rocking of the switch to one side. Rocker actuator is familiar in mainly on and off switches. They rock or prior about the center one and include both maintenance and momentary contact.

**2.2.2 LIMIT SWITCHES:** Some switches are specifically designed to operate by the motion –by the motion of a machine rather than by the hand of a human operator. This motion operated switches are commonly called limit switches, because they are often used to limit the motion of a machine by turning off the actuating power to a component if it moves too far as with hand switches, limit switches come in several varieties.

**i. Reed switches:** They are magnetically activated switch. They are typically manufactured with two ferromagnetic reeds (contact blades) which are sealed in a glass capsule. In the presence of a magnet, the blades (contacts) close.

**ii. Lever Actuator limit switch:** These limit switches closely resemble tagged toggle or selector hand switches fitted with a lever pushed by the machine part often, the lever are tipped with small roller bearing, preventing the lever from being worn off by repeated contact with the machine part.

**iii. Proximity switch:** Proximity switch sense the approach of metallic machine part either by magnetic or high – frequency electromagnetic field. Simple proximity switches use a permanent magnet actuates a sealed switch mechanism whenever the machine part gets close (typically 1 inch or less). More complex proximity switches work like a metal detector energizing a coil of wire with a high –frequency current, and electronically monitoring the magnitude of that current. If a metallic part (not necessarily magnetic) gets close enough to the coil the current will increase, and trip monitoring circuit. Another form of proximity switch composed a light source and photo cell. Machine positions are detected by either the eruption or reflection of a light beam. Optical switches are also useful applications, where beams of light can be used to detect personal entry into a dangerous area.

**2.2.3. PROCESS SWITCH:** In much industrial process, it is necessary to monitor various physical quantities with switches. Such switches can be used to sound alarms, indicating that a process variable has exceeded signal parameters, they can be used to shut processes or equipment if those variables have reacted dangerous destructive levels.

i. **Mechanical Key Switch:** Micro switch is a mechanical switch requiring physical contact for operation. When contact is made with the switch trigger, the switch contacts are activated.

Most micro switches can be wired as “normally open “or” normally closed”. When wired as “normally open” with the switch in its rest position (not activated) the circuit is open, no current flow-when activated, the contacts are closed, completing the circuit.

When wired as “normally” closed” with the” switch in its not position (not activated), the contacts are closed, completing the circuit. When activated the contacts are opened, breaking the circuit. When activated the contacts are opened, breaking (opening) the circuit. When we press a key on our piano keyboard we are activate a micro-switch.

ii. **Keyboard Switch:** These are mechanical switches made up of two pieces of conductors pushed together as you press a key. The actual switch elements are

phosphor- bronze alloy with gold plating on the contact areas, the key switches sometimes contain return springs. In recent times, they consist of silicone domes with small pieces of conductive rubber on the underside. When a key is pressed, the rubber foam shorts two traces on a printed circuit board to produce the key pressed signal. A major disadvantage is that a contact becomes oxidized or dirty with age, so they no longer make dependable connection. Higher quality switches typically have a life span of about one million key strokes. The silicone dome type typically last twenty five million key strokes.

**iii. Membrane Key Switch:** These switches are really just a special type of mechanical switch. They consist of a three layer plastic or rubber sandwich. The top layer has a conductive line of silver ink running under each column of keys. When you press a key, you push the top ink line through the hole to contact the bottom ink line. The advantage of membrane keyboard is that they can be made as very thin sealed units. They are often used on cash registers in most fast food point and in teller machines and other rugged applications. The life-span of membrane keyboard is wide and varies.

**iv.    iii. Capacitive Key Switches:** A capacitive key switches have two separate tiny metal plates on printed circuit board and another metal plate on the button of a piece of foam. When you press the key, the movable plate is premed closer to field plates so that capacitance between them is sensed by an amplifier circuit. This produces the required logic. The big advantage of a capacitive switch is that it has no mechanical contacts to become oxidized or dirty. A small disadvantage is that specialized circuiting is needed to detect the changes in capacitance. This switcher has a lifetime of twenty million keystrokes.

**iv.    Hall Effect Key Switches:** This is another key switch that requires no mechanical contact. It takes advantage of the fact that a moving charge can be deflected by a magnetic field. A reference current is passed through a conductor crystal is moved through magnetic field which has its flux lines perpendicular to the direction of current flow in the crystal. Moving the crystal through the magnetic field causes a small voltage to be developed between two of the other opposing faces of the crystal. This voltage is amplified and used to indicate that a key has been pressed. Hall Effect keyboard are also used to detect motion. They are expensive but very dependable and have typical lifespan of one hundred millions keystrokes.

#### 2.2.4 ELECTRONICS SWITCHES/LOGIC SWITCHES

Mechanical control switches have long been replaced in many applications by electronics varieties which can be intelligently control and automated. In principle, it is easy to design silent switches in which the mechanical contacts do not directly control the current, but simply signal a solid state device such as a transistor, thyristoretic to complete the circuit. Many variation of this have been forward based. The point is that any sufficient Dc source can be used to turn on the transistor. Note that when a transistor is used to control or switch DC power to a load we operate it in either of two states. The first is when base current is zero this is called cut off state, since the transistor is fully none conducting. Secondly we have the saturation state, when the transistor base current causes the collector current to go very high (maximum) the transistor is fully conducting.

Silicon controlled Rectifier switches: One of the most popular electronic switches is the silicon controlled rectifier or two transistors equivalent circuit. The circuit shows directly connected transistor one an NPN and the other a PNP. The key to understanding this circuit is to recall that BTTS do not conduct without the application of base current.

Logic gate as switches: The base building block of any digital circuit is the logic gate can be constructed by using simple switches, relay vacuum tube, transistors

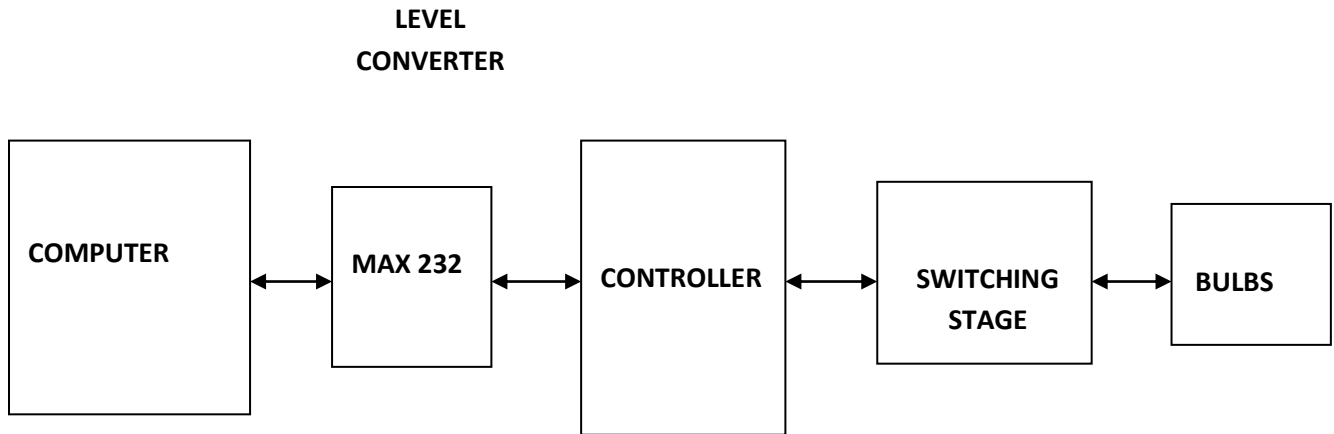


and diodes or ICS. Here are different types of Logic gate; Or Gate and gate, not gate, The Exclusive or gate & the exclusive Note gate.

The not gate: if the gates so far have had at least two inputs and output. The Not circuit lower has only one input and one output. The not circuit often called an inverter. The % of not circuit (inverter) is to give an output that is not the same as the input.

### **2.3COMPUTERS AS A SWITCH**

A computer is a system containing millions of electronics switches which functions as units making up the entire system. It can therefore be used to control or switch external devices via commands. This is achieved by designing a hardware interface circuit (i.e. switching Device) consisting of a power supply, buttering transistors stage and micro controller and an RS 232 level converter. The interface is connector. This is able to switch “on” and “of” ac 60 watt bulbs, TV, air conditions, fridges etc but in this work six necessary trigger control on the interface. For the interface to coordinate the switching activity of the bulbs a microcontroller is used to interact with the part ria the RS 232 level converter chip.



Microcontroller with level converter chip.

## 2.4 SERIAL PORTS

The asynchronous serial interface was designed as a system to system communications port. Asynchronous means that no synchronization or clocking signal is present, characters can be sent with any arbitrary time spacing.

Each character that is sent over a serial connection is framed a standard-start and stop signal. A single 0 bit, called the start bit, precedes each character to tell the receiving system that the next eight bits constitute a byte of data. One or two stop bits follow the character to signal that the character oriented and has an approximate 20% over head for the extra information that is needed to identify each character.

Serial refers to data that is sent over a single wire, with each bit lining up in a series as the bites are sent. This type of communication is used over the phone system because it provides one wire for data in each direction.

#### **2.4.1 TYPICAL LOCATIONS FOR SERIAL PORTS**

Typical systems include one or two serial ports, with connectors typically located at the rear of the system. Some recent consumer-oriented computers label a front-mounted serial port the “digital camera port”. This name comes from the use of serial ports for data transform from low-ports are controlled by a highly integrated south Bridge chip in the latest motherboard designs.

#### **2.4.2 I/O INTERFACES FROM SERIAL AND PARALLEL TO IEEE 1394 AND USB**

If you need more serial ports your system has, you can purchase single or multi-port serial port cards or so-called multi-I/O cards that feature one or two serial ports and one or two parallel ports. Older system based on the ISA or VL- Bus standard often have the serial ports attached to a multifunction card that also has IDE hard disk and floppy disk interfaces.

Note: That card-based modern also incorporate a built in serial port on the card as part of the modern circuitry.

The limiting factor is the total load capacitance of cable and input circuit of the

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The limiting factor is the total load capacitance of cable and input circuit of the interface. The maximum capacitance is specified as 2500pF (Pico farads) special low-capacitance cables can effectively increase the maximum cable lengthgreatly.

## **CHAPTER THREE**

### **SYSTEM ANALYSIS AND METHODOLOGY**

#### **3.1 INTRODUCTION**

The aim of system analysis is to ensure the proper execution of the right decision is taken. System analysis reveals major problem areas that should be discarded. But once the basic operations that generate poor performances in the old system are determined, the tendency that the new system will produce the same problem is highly reduced or minimized tremendously.

The objectives of system analysis include;

- Identify the user need.
- Evaluate the system concept for feasibility
- Allocate functions to hardware software, people, database and other system elements.
- Create a system definition that forms the foundation for subsequent engineering work.

#### **3.2 ANALYSIS OF THE EXISTING SYSTEM**

In Nigeria today light are been regulated at home and at work (offices) manually. The regulation of light always requires one to move from one pole to another in other to switch on or off the light. In this system, each pole may require a switch.

The controls are installed or incorporated in the built environment such as the poles, walls or attached to light which people place them. Due to the different switches placed on a bulb, it often leads to a jumble of controls i.e. each with their own location, interception style and focus.

This system does not have prior information about bulbs. The system cannot tell whether bulb is dead or not. All it does is switch off and on light. This system cannot manage lighting operations or activities but can only on and off light. It consumes energy and only needs a two wire control.

### **3.2.1 ADVANTAGES OF THE EXISTING SYSTEM**

- It is easy to use
- It does not require skill
- It only require a two cable wire connected to the switch
- A pole could have two or more way switches
- It is cheap to acquire.

### **3.3.2 DISADVANTAGES OF THE EXISTING SYSTEM**

- It consumes energy (electricity)
- It consumes time and energy i.e. one moving from one pole to another to turn is it on or off
- A switch cannot control many individual lights

- The system cannot detect when a bulb is dead
- Switches easily get bunt where there is any linkage.

### **3.3 JUSTIFICATION OF THE PROPOSED SYSTEM**

The proposed system is a computerized simulation system that will control eight bulbs, powered with 220volt Ac public supply. This implies that an interface is needed to communicate with the eight bulbs without damaging the Pc part. The first and major consideration is the use of serial comports and how to connect it to external devices, this will be followed by details of the immediate interfacing integrated circuit chips and hardware and software development.

A single or multiport I/O cards are needed on the system unit of the pc; some has one or two serial ports and card. A standard a pin connected is needed. Device like modern, plotters printers etc. also use this same connector.

Because of the flexibility of the proposed system, I think that it will be necessary to have this new system in our environment. For the fact that the new system reduces energy consumption is enough to convince us that the system is good enough to employ in our society. This new system will manage to tell all the lighting operation. This system will be able to tell when a bulb is alive and when it's dead.

### **3.3.1 ADVANTAGES OF THE PROPOSED SYSTEM**

- The major advantage of the proposed system is the ability to control individual light or groups of light from a single user interface
- It reduces energy consumption
- It reduces installation cost and increase flexibility
- It notifies the operation when a bulb is down
- It does not consume time and energy.

### **3.3.2 DISADVANTAGES OF THE PROPOSED SYSTEM**

- This system is very expensive
- It requires skills to operate i.e. one have to be computer literate
- Stray voltage could cause damages
- It cannot automatically switch off or on.

### **3.4 CONNECTING THE PORT TO EXTERNAL DEVICE INTERFACE**

Since the serial communication on comports are with RS232 standard the easiest way to connect external devices is to use widely available Max 232 chips, this chip from Texas instruments is built mainly for this purpose-namely to convert Rs232 levels to digital logic high (1) or low (0)

### **RECOMMENDED OPERATING CONDITIONS**



		Min	NonMax	Unit
Vcc	Supply voltage	4.5	5	5.5 v
V1H	High level input voltage			
(TIIN, T21N)		2		v
ViL	Low-level input voltage			
(TIIN, T21N)				0.8 v
RLLN, R2IN	Receiver input voltage			30 v
Max 232 0 70	°C			
TA	Operating free air term			
MAX 2321	-40 86			°C

Electrical characteristics over recommended ranges of supply voltage and operating free air temperature (unless otherwise noted).

PARAMETER	TEST CONDITIONS	MIN	TYP1	MAX	UNIT
	Vcc= 5.5v, all outputs open				
Icc supply current	TA = 25°C	8	10		mA

≠All typical value are at Vcc = 5v and Ta = 25°C

Note: Test conditions are C1-c2 = Iyf at Vcc = 0.5v

### 3.4.1 CONNECTING MAX 232 TO THE SERIAL PART

Dc voltage requirement with no cable connected to serial port

The first and simple test is to measure the Dc voltage to pin 2 of the serial port without any cable attached, and also the voltage on pin 2 and 6 of the Max 232 chip. the exact voltages will depend on which chip is installed on the board and the voltage output of the typical values to expect.

Installed chip	DB9 pin 2	MAX 232 pin 2	MAX 232 pin 6	
Texas instruments MAX 232	-9.9v	+9.93		-9.9v
Maxim MAC 232 CPE	-8.5v	+8.9v	-8.5v	

The RS-232 standard requires serial ports to transmit high and low using at least +5 volts for high and least -volts for low the max 232 chip includes charge pump power supply circuit which creates these higher voltages on pin 2 and 6. A measure of positive voltage significantly higher them +5 volts, and a negative voltage significantly great them aril, shows, that charge pump in working with no cable connected, pin 2 of the serial port should be measured approximately the same voltage at pin 6 on the Max 232.

### 3.4.2 DC VOLTAGE CHANGE WITH CABLE CONNECTED

When you connect the serial cable to your pc and the board, the voltage measurement in pin 2 should change.

You should see less voltage, because the PS- 232 standard requires all transmitters to implement series output impedance, and all receivers to implement parallel input independence.

A typical drop may be -9.9 volts without the cable to -9.0 volts with the cable attached, using the ST 232 chip. Some chips may drop ever more, as much as 2 volts, depending on the combination of the MAX 232 clip on the 8051 development board and the clip inside your PC. The exact drop is not important, as long as the output is still greater than -5 volts.

If you do not see any drop in voltage. It's quite likely the transmit signal is not connecting to a receiving input on your Pc. If you see the voltage grow to a larger value, it's very likely your cable is a null modern cable, and the higher voltage is from another transmitter in your PC's serial port.

These simple DC voltage measurements can establish that your MAX 232 clip is

producing correct signal levels and driving a receiver in the Pc, but to truly verify all the circuitry, a data flow in necessary.

### 3.4.3 AC AND DC VOLTAGE WITH DATA FLOW

If the 98c652 is transmitting data from its TxD pin, but you cannot receive it on your Pc, then this section will help you trace the data flow from the TxD pin to your serial cable.

## 3.5 SWITCHING STAGE

The application of transistors is not only eliminated to amplification of signals but also widely used for digital switching control applications.

The circuit and its connection to the controller port of one pins is shown below.

The relay coil resistance is 100 $\Omega$  hence the collector current at saturation that energizes the relay to light a bulb is;

$$I_c(\text{sat}) = V_{CC}/R_c = 12\text{V}/100 = 120 \text{ MA}$$

Calculating  $I_B(\text{min})$

$$I_b = V_{in} - 0.7/R_B = V_{IH} - 0.7/R_B = 3.5 - 0.7/4700 = 596 \text{ MA}$$

Testing for saturation condition

$$I_B - I_C(\text{sat})/$$

$B_{dc}$

$B_{dc}$  for the Bc 547 transistor is 300

Thus;

$$I_{B\text{min}} = 596\mu\text{A} \quad I_{C\text{sat}}/B_{dc} = 120\text{MA}/300 = 400 \text{ MA}$$

For cut of condition

If  $V_{in} = V_{il} = 0$  or  $I_B = 20 \text{ MA}$  and since we are assuming  $I_c = I_{CEO}$ , the voltage drop across relay coil  $R_c$  is determined by  $V_{RC} = I_C R_c = 0$  or resulting to  $V_{CE} = V_{CC}$  this iv

cut of condition and since  $1c = 0$  the relay remains open & the bulbs will not light. This circuit is repeated six times for a bulbs connected to port 1.0 to port 1.5 of the controller.

Note: To prevent spikes, a simple diode 1w4004 is wired across the relay coils as show above.

### **3.5.1 RELAY STAGE**

Relay events a magnetic field that moves an armature (contact) when an energizing current is through the relay coil. The coil current can be non-off, that the relay may have two states; Energized state and non-energized state. It enables us to use small logic output voltage/ current -2MA to pass relatively large current (10A) to Ac bulbs. Most of the available relays use up to 100MA which logic gates cannot supply directly-this causes users to always use a transistor switch as a go between. Also they can be SPDT or DPNT.

#### **3.5.1.1 RELAYS**

The diagram shows a working relay with its coil and switch contact. You can see a lever on the left being attracted by magnetism when the coil is switched on. This lever moves the switch contact. There is a set contact (SPDT) in the foreground and another behind them making the relay DPDT

The relay's switch connections are usually labeled CAM, MC and NO;

- COM =Common, always connected to this, it is the moving part of the switch
- NC = Normally closed, COM is connection to this when the relay coil is on
- NO = Normally open, COM is connection to this when the relay coil is on

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

### 3.5.1.2 CHOOSING A RELAY

Several features need to be considered when choosing a relay;

- **PHYSICAL SIZE AND PIN ARRANGEMENT:** If you are choosing a relay for an existing PCB you will need to ensure that its dimensions and pin arrangement are suitable. You should find this information in the supplier's catalogue.
- **COIL VOLTAGE:** The relay's rating and resistance must suit the circuit powering the relay coil. Many relays have a coil rated for a 12v supply but 5v and 24v relays are also readily available. Some relays operate perfectly well with a supply voltage which is a little lower than their rated value.
- **COIL RESISTANCE:** The circuit must be able to apply the current required by the relay coil. You can use ohm's law to calculate the current

$$\text{Relay coil current} = \frac{\text{Supply voltage}}{\text{Coil resistance}}$$

Example:

A 12v supply relay with a coil resistance of 400 passes a current of 30 MA. This is ok for a 555 timer 1c (maximum output current 200MA), but it is too much for most 1c, and they will require a transistors to amplify the current.

- **SWITCH RATINGS (VOLTAGE AND CURRENT):** The relay's switch contacts must be suitable for the circuit they are the control you will need to check the voltage and current ratings. Note that the voltage rating is usually higher for AC, for example, "5A at 24v DC or 125v AC"
- **SWITCH CONTACT ARRANGEMENT (SPDT, DPDT ETC):** Most relays are SPDT or DPDT which are often described as single pole change-over (SPCO) or double pole change over" (DPCO) for further information please see the page on switches.

**3.5.1.3 PROTECTION DIODES FOR RELAYS:** Transistors and 1cs must be protected from the brief high voltage produced when a relay coil is switched off. Current flowing through a relay coil creates a magnetic field which collapse suddenly when the current is switched off. The sudden collapse of the magnetic field induces a brief high voltage across the relay coil which is very likely to damage transistors and 1cs. The protection diode allows the induced voltage to drive a brief current through the coil (and diode) so the magnetic field dies away quickly rather than instantly. This prevents the induced voltage becoming enough to cause damage to transistors and 1cs.

#### **3.5.1.4 REED RELAYS:**

Reed relays consist of a coil surrounding a reed switch, reed switches are normally operated with a magnet, but in reed relay current flows through the coil to relates a magnetic field and close the reed switch. Reed relays generally have higher coil resistant than standard relays (1000 for example) and a wide range of

supply voltage (9-20v for example). They are capable of switching much more rapidly than standard relays, up to several hundred times per second, but they can only switch low current (500mA maximum for example.) The reed relays shown in the photograph will plug into a standard 14-pin DIL socket (1c holder).

**3.5.5 RELAYS AND TRANSISTORS COMPARED:** like relays, transistors can be used as an electrically operated switch. For switching small DC current (<1A) at low voltage they are usually a better choice than a relay. However transistors cannot switch AC or high voltage (such as mains electricity) and they are not case a relay will be needed, but note that a low power transistor may still be needed to switch the current for the relays coil. The main advantages and disadvantages of relays are listed below.

### **3.5.6 ADVANTAGES OF RELAYS**

- Relays can switch AC and DC, transistors can only switch DC
- Relay can switch high voltage, transistors cannot
- Relays are better choice for switching large current (>5A)
- Relays can switch many contacts at once.

### **3.5.7 DISADVANTAGES OF RELAYS**

- Relays are bulkier than transistors for switching small current
- Relays cannot switch rapidly (except reed relays) transistors can switch many times per second
- Relays use more power due to the current flowing through their coil

- Relays require more current than many ICs can provide, so a low power transistor may be needed to switch the current for the relays coil.

### **3.6 RESEARCH METHODOLOGY**

The main reason for all analysis is to find what information the system should manage, what fact to find and search for how to find them and how to record. However to execute these objective's, structured system analysis and design methodology were used. This is because; (SSADM) is an internationally accepted software engineering model. The various steps involved in the model are as follows;

- Problem deification
- Feasibility study
- System analysis
- System implementation
- Program maintenance and
- System design



- Program coding
- Program testing
- Documentation.

#### PROBLEMS IDENTIFICATION

The basic problem and weaknesses associated with the present system were explain in this chapter.

It was these weaknesses of the present system that lead the research to develop an enhanced had more active system to overcome the shorting coving and drawbacks of the present system.

Hence in identifying these problems I was able to clarify the new systems objective and users desire output, desired inputs and desired processing.

TEASIBILITY STUDY During this process, investigation was thoroughly made in order to develop the new system in significant depth. This is done to enable the proposed system to periodic information that can justify its implementation.

The method of data collection used in the course of finding the feasibility of the new system includes,

EXAMINATION OF RECORDS AND PROCEDURE MANUEL: the existing procedures and records of the present system were examined in to carry out the procedures of the new system more effectively.

WEBSITE RESEARCH: Different document on the World Wide Web (www) were reviewed to find information which was essential in writing the chapters and software design.

LIBRARY RESEARCH: Book, journals and magazines were reviewed to collect all necessary informational which were also used in writing and designing the new system.

#### SYSTEM DESIGN

Architectural design and detailed design processes are involved broken down into components called modules. Each of the modules in tem is designed, which is known as detailed design.

#### PROGRAM CODING

The logical requirements from flowcharts down from the proposed system were translated into a programming language I.e. numbers, letters and symbols that make up the program source code

#### PROGRAM TESTING

After coding the program, alpha testing method which involves checking and debugging of the new program was used in running each module of the program with a few data in other to detect any syntax, time or logical errors.

#### SYSTEM IMPLEMENTATION

During this phase, I was able to document the users training and instruction on the changes the new system will introduce in the area of information management and decision making.

#### SYSTEM MAINTENANCE

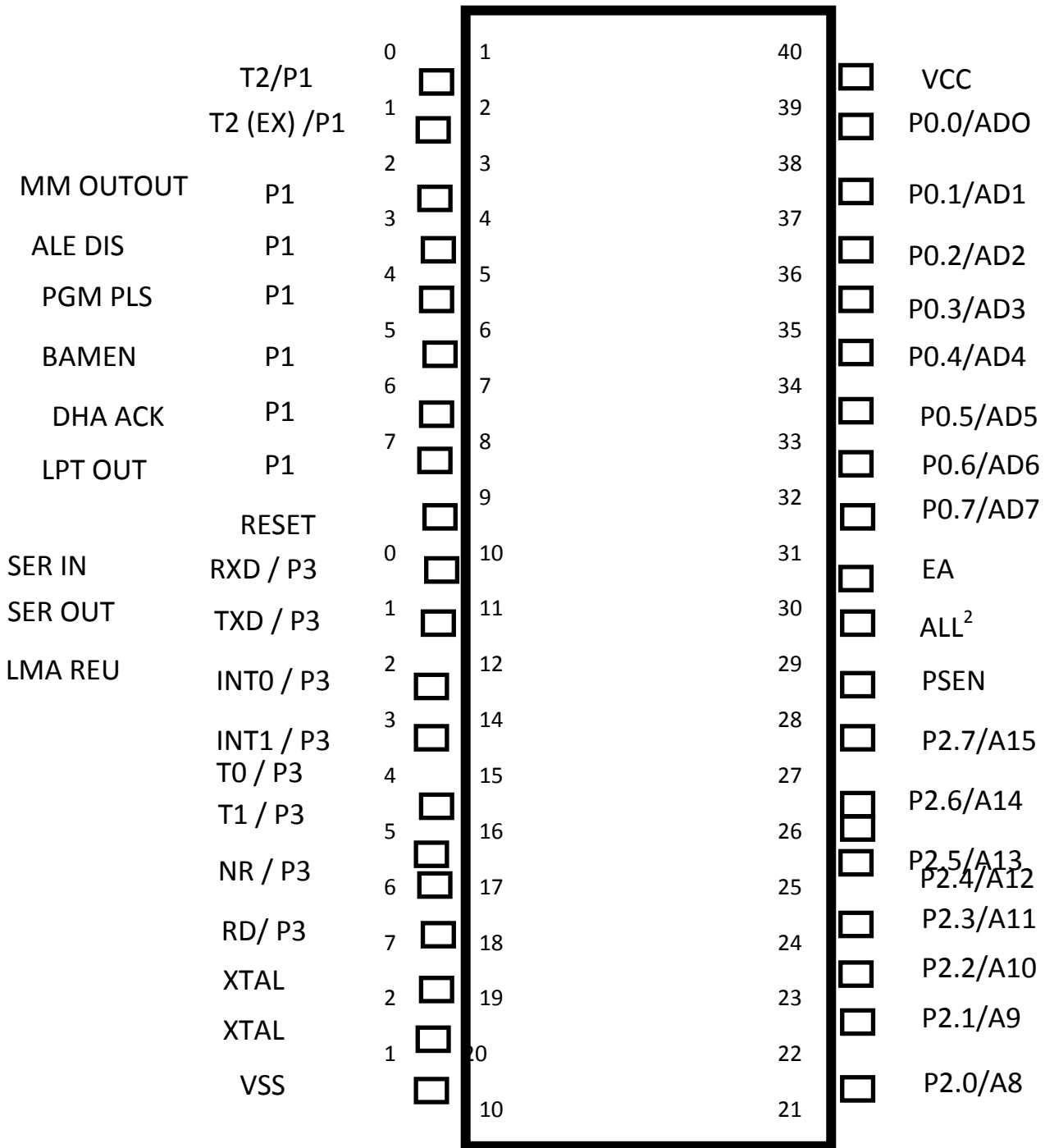
The maintenance used in the system is the enhancement of software update which consists of change to the specification and implementation of the changes.

#### DOCUMENTATION

This was designed to fulfill two basic functions, to enable users to operate the program correctly and to enable another person understand the program so that it may, if necessary be modified or corrected by someone else.

### 3.7 THE DIAGRAM BELOW SHOWS THE PIN-OUT OF THE 8051 MICRO CONTROLLERS

#### BASIC -52 FUNCTIONS



8031 PIN-OUT

### **3.7.1 ELEMENT OF THE 8051**

Here are the major elements of the 8051

**CPU:** The CPU, or central processing Unit, executes program instruction. Types of instruction include arithmetic (addition, subtraction) logic (AND OR, NOT) data transfer (move) and program branching (Jump) operations. An external crystal provides a timing reference for clocking the CPU

**ROM:** ROM (ready-only-memory) is programmed into the chip in the manufacturing process. In the 8052-BASIC, the ROM contains the BASIC-52 interpreter program that the 8052 executes on boot up. As far as hardware is connected, this is the only difference between the ordinary 8052 and the 8052-BASIC.

### **3.8 POWER SUPPLY**

The AC voltage, typically 240V connected to a transformer which steps voltage down to the level for the desired D.C. output. A diode rectifier then provides a full wave rectified voltage that is initially filtered by a simple capacitor filter to produce a DC voltage. The resulting DC voltage has some ripple or AC voltage variation.

A regulation circuit can use this DC input to provide a DC voltage that not only has much less ripple voltage varies some the load D.C value even if the input DC voltage varies, somewhat or the load connected to the output DC voltage changes.

Three terminal voltage regulator

The fixed voltage regulator has an unregulated DC input voltage  $V_{in}$  from a second terminal with the third terminal connect to ground.

### **3.9 TRANSFORMER**

This is an apparatus for changing electrical energy from one voltage to another. Here a market value of 6V transformer will do the job. 500mA transformer is preferred to stand in normal operation for 312.9mA. Diode to be in 4004

The diode bridge without filter will give high frequency harmonics that are undesirable without filter, the wave-form at the bridge output is  $v_0$  (dc). With a filter the power output becomes almost free of ac that is pure dc.

## **CHAPTER FOUR**

### **SYSTEM DESIGN AND IMPLETATION**

#### **4.0 INTRODUCTION**

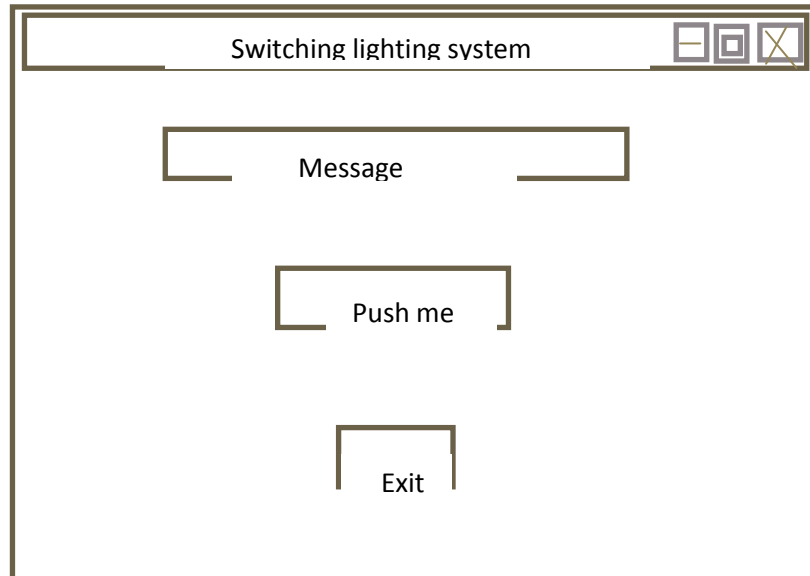
System design is a process sorting by which a new system is design or developed after sorting out the problems associated with an existing system. However, system design covers the design of the new system after a detailed study of the present system which specifies the expected output and identifies the input requirements of the proposed system for better performance. Structure system analysis and design methodology were adopted during the design phase to provide a hierarchical top down design of the proposed system.

#### **4.1 OVER VIEW OF DESIGN**

Following the details design phase, is construction of implementation of the details that has been specified. The process involved gathering of 1c's components like transistors, relays microcontroller, crystal oscillator etc.

Working in accordance with set objective of the overall system design a source code program that incorporate the give feature of the design was developed. The program is able to generate data that can be used to trigger or control the interfaced circuit via the parallel port interface.

## 4.2 MAIN MENU

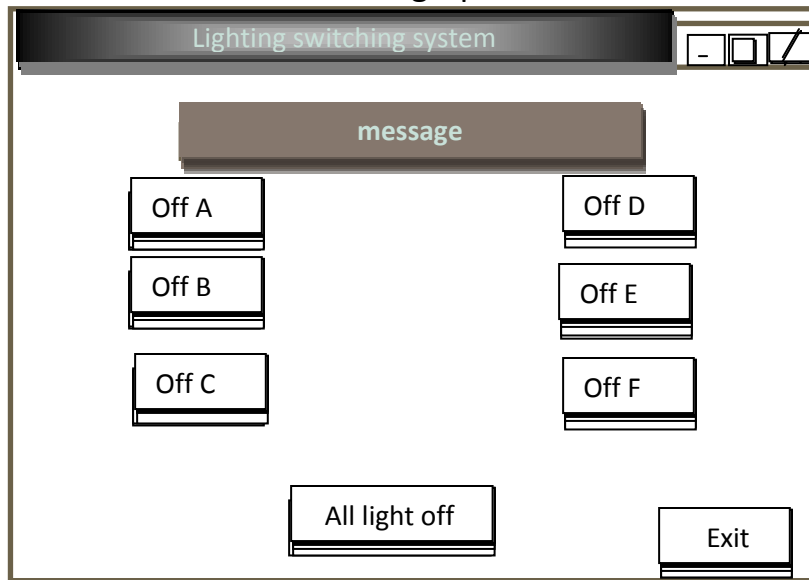


### 4.2.1 PROGRAM MODULES SPECIFICATION

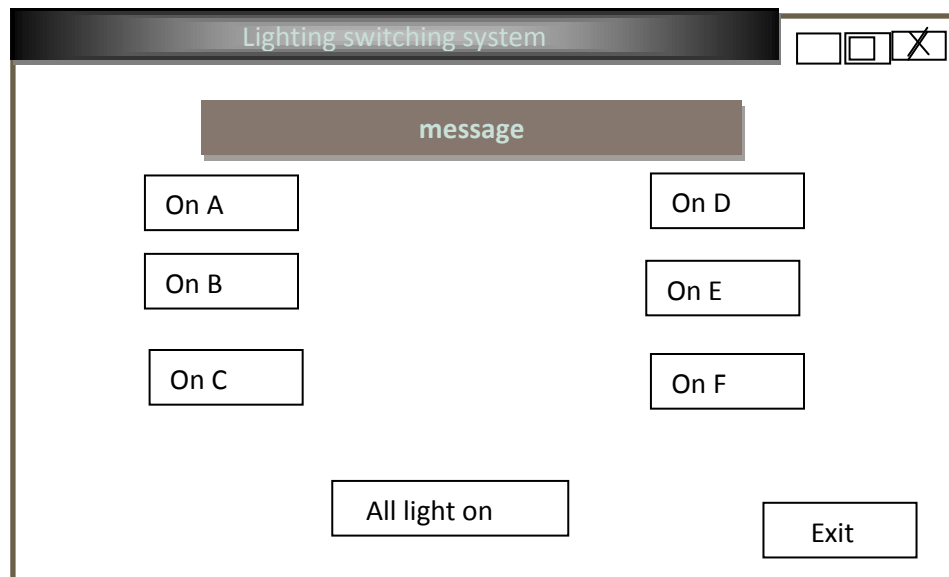
S/N	MODULES	DESCRIPTION
1	Firm welcome	This form displays a welcome message
2	Firm push form	This form gives access to the main interface
3	Firm Exit	This form enables one to logoff from the program

## 4.2.2 INPUT/OUTPUT SPECIFICATION

The detail results of the events in the graphical user interface are;

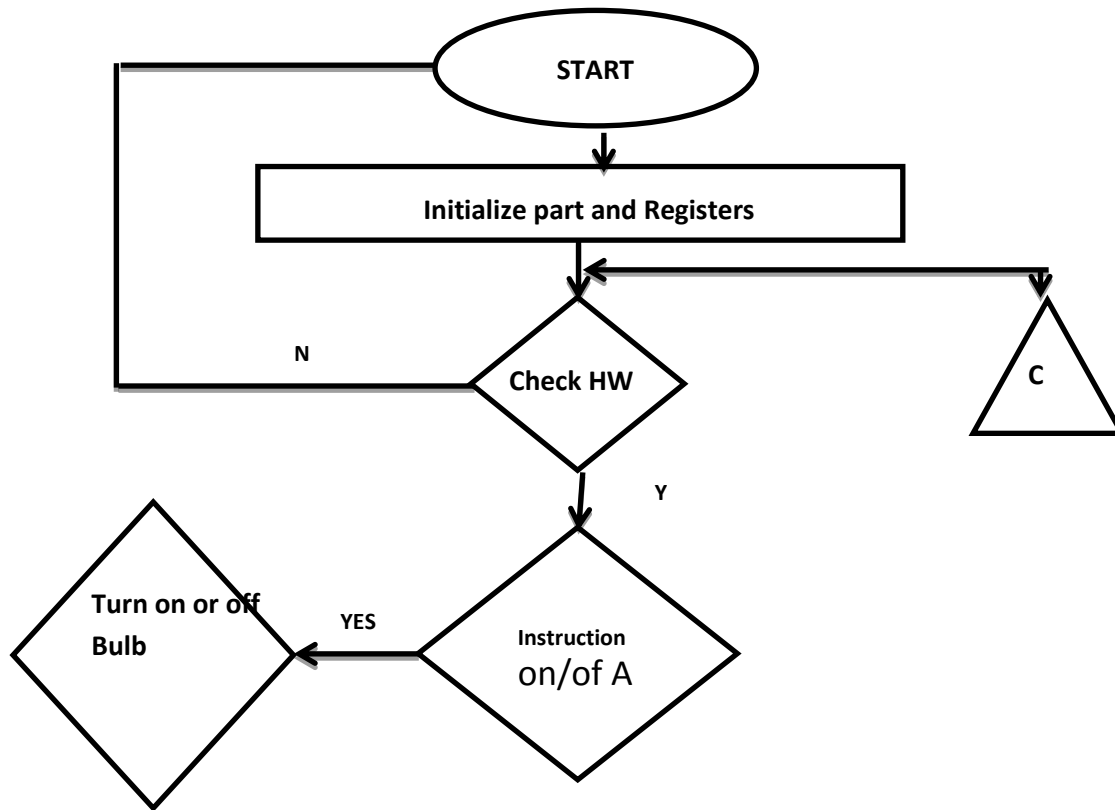


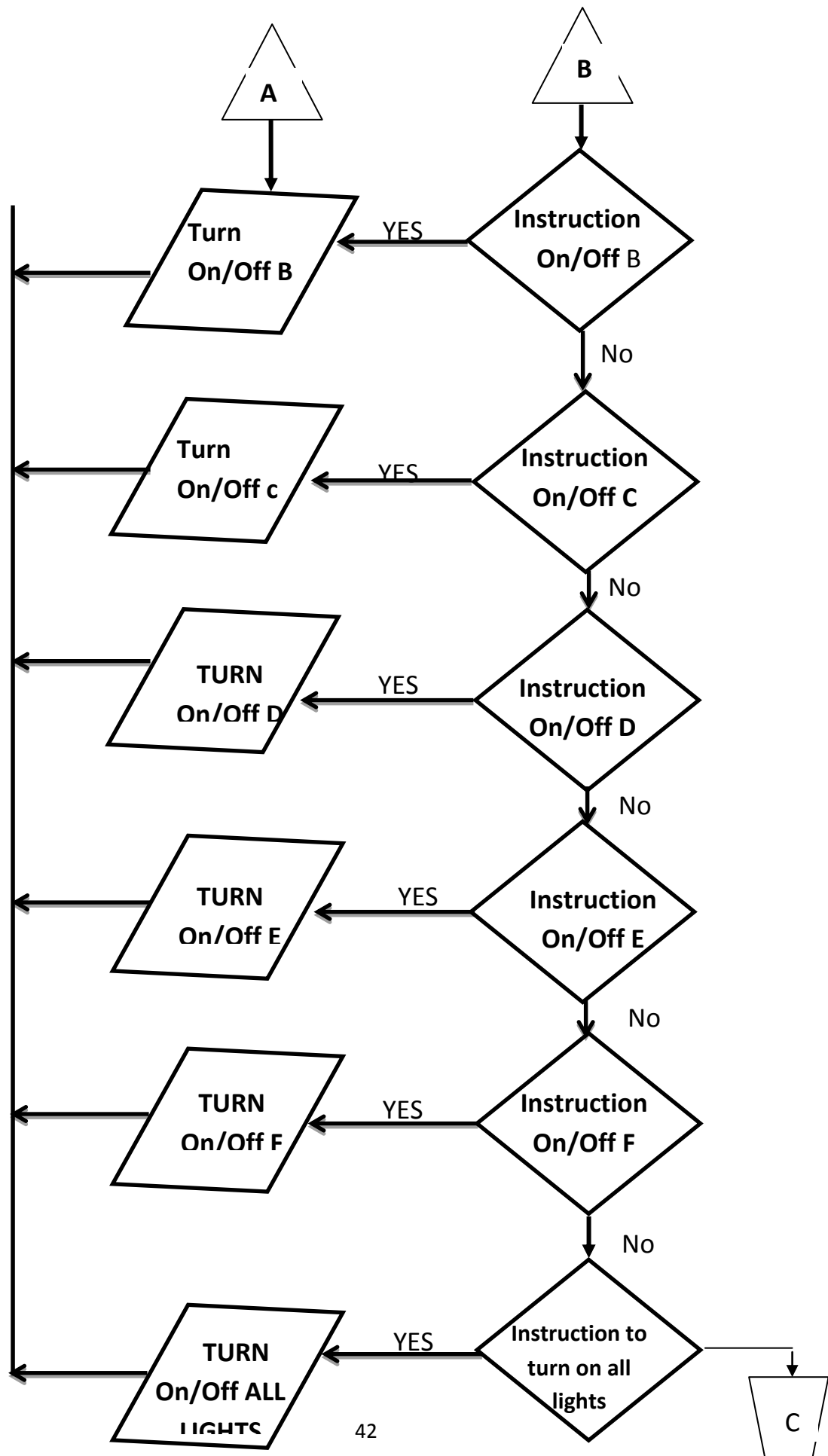
## INPUT INTERFACE





### 4.2.3 FLOWCHART OF THE PROPOSED SYSTEM





### **4.3 CHOICE AND JUSTIFICATION OF PROGRAMMING LANGUAGE**

The choice of programming language of this project is based on flexibility versatility and machine language efficiency (as afforded by high level language such as visual basic) visual basic programming is used to code the program. Reason is that it is relatively easy to code and it has a graphical user interface that is user friendly and easy to operate. It is also easy to covert this source code written in visual basic to machine language.

### **4.4. SYSTEM REQUIREMENT**

Basically, this system requires hardware and software for this system to stand alone, one will have to consider the materials that will enable it and such materials are 1cs, components like transistors, relays micro- controller, crystal oscillator, Vero board , bulbs, cables, steps down transformer, monitor, cpu i.e. the hardware. This hardware needs to be coupled together i.e. to work together in other to achieve our goal.

Secondly, the operating system that is required is window xp operating system. In window xp operating system, user and administrator level account do not have

access directly to the serial port so an 1o dll linker provide access to the port.

Visual basic 6.0 is used to design the graphical user interface.

#### **4.5 IMPLEMENTATION PLANS**

As soon as the hardware interface has consummated and the application program in visual basic 5.0 has been complete we want ahead connecting the interface to the pc serial port via the cable. We utilized visual basic as front and when controls were imitated to bulb one. The command buttons controls on and off event when clicked and when not clicked respectively. A driver literally links the VB program and the serial port.

#### **4.6 MAINTENANCE DETAILS**

Change is invertible therefore mechanism must be developed for evaluation, controlling and making modification. The system should be adaptive, perfective, corrective and preventive. This is to ensure that the system copes with any atmosphere.

## **CHAPTER FIVE**

### **CONCLUSION AND RECOMMENDATION**

#### **5.0 SUMMARY**

In brief a summary, the new system has shown a good number of achievement which include; less usage of energy, motoring of all lighting equipment such as the bulb, management of all the lighting equipment usury of a single button to switch on or off light feedback i.e. message alerting and accuracy measure in switching.

#### **5.1 CONCLUSION**

This project in terms of Hardware and software was fully implemented. The software was produced in triplicate on CD-ROM. The software is easily installable and runs on windows XP and seven.

#### **5.3 RECOMMENDATION**

The idea of computerization is to design and develop a system which is accurate in switching and easy to use. In line with this, the following recommendations an made for proper and efficient running of the system.

Power failure may lead to difficulties if it is not very frequent, therefore, installation of an un interrupted power supply system is the system should be closely monitored in order to be acquitted with it and equally make an adjustment wherever the need arises.

The software should be installed in more than one system at home. If possible, install in the kitchen system sitting room and bed room.

#### **5.4 SUGGESTION FOR FURTHER STUDIES**

The following features can be included or work on by the next research of this project.

- A microprocessor can be used instead of a microcontroller if large amount of controls and program data base are to be developed for thousands of highly points.
- The program can be written so it could, be access from any pc in the computer LAN.
- The interface can be designed to be wireless with infrared or blue both tooth to the serial port.
- Voice communication can be included so that the bulbs can go off as a particular voice is used as input.

With the above mentioned additions, I hope a real improvement in this work would be made.

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## APPENDIX 1

List of the system components;

1. Relay 6v
2. BC 547 transistor
3. 1K resistor
4. Microcontroller
5. IC base
6. Max 232
7. Transformer
8. Bridge rectifier
9. Filter capacitor
10. LED light Emitting Diode
11. IC regulator
12. Vero board
13. Jumpers
14. Diodes
15. DB-9 connector
16. 11.0592MHz crystal oscillator

17.30 Pico farad capacitor

18.10 microfarad capacitor

19.2 pin plug

20.Bulb

21.Monitor

22.Central processing unit (CPU)

23.Keyboard

24.Mouse.

## APPENDIX 2

### SOURCE CODE

```
[IconGroups]
Group0=Switching system
PrivateGroup0=True
Parent0=$(Programs)
```

```
[Switching system]
Icon1="6relay.EXE"
Title1=Switching system
StartIn1=$(AppPath)
```

```
[Setup]
Title=CONTROL
DefaultDir=$(ProgramFiles)\Project1
AppExe=6relay.EXE
AppToUninstall=6relay.EXE
```

```
[Setup1 Files]
File1=@MSCOMM32.OCX,$(WinSysPath),$(DLLSelfRegister),$(Shared),6/23/98
11:00:00 PM,103744,6.0.81.69
File2=@6relay.exe,$(AppPath),,$(Shared),12/9/07 7:45:56 AM,28672,1.0.0.0
```

```
.OPTION EXPLICIT
.Set Cabinet=off
.Set Compress=off
```

```
.Set MaxDiskSize=CDROM
.Set ReservePerCabinetSize=6144
.Set DiskDirectoryTemplate=".."
.Set CompressionType=MSZIP
.Set CompressionLevel=7
.Set CompressionMemory=21
.Set CabinetNameTemplate="6relay.CAB"
"Setup.Lst"
"setup.exe"
.Set Cabinet=on
.Set Compress=on
"6relay.exe"
"msvbvm60.dll"
"oleaut32.dll"
"olepro32.dll"
"asycfilt.dll"
"stdole2.tlb"
"COMCAT.DLL"
"MSCOMM32.OCX"
"SETUP1.EXE"
"VB6STKIT.DLL"
"ST6UNST.EXE"
```

#### [Bootstrap]

```
SetupTitle=Install
SetupText=Copying Files, please stand by.
CabFile=6relay.CAB
Spawn=Setup1.exe
Uninstal=st6unst.exe
TmpDir=msftqws.pdw
Cabs=1
```

#### [Bootstrap Files]

```
File1=@VB6STKIT.DLL,$(WinSysPathSysFile),,,6/17/98 11:00:00
PM,102912,6.0.81.69
File2=@COMCAT.DLL,$(WinSysPathSysFile),$(DLLSelfRegister),,5/30/98 11:00:00
PM,22288,4.71.1460.1
```

File3=@stdole2.tlb,\$(WinSysPathSysFile),\$ (TLBRegister),,8/4/04 4:00:00  
AM,17920,3.50.5014.0  
File4=@asycfilt.dll,\$(WinSysPathSysFile),,,8/4/04 4:00:00  
AM,65024,5.1.2600.2180  
File5=@olepro32.dll,\$(WinSysPathSysFile),\$ (DLLSelfRegister),,8/4/04 4:00:00  
AM,83456,5.1.2600.2180  
File6=@oleaut32.dll,\$(WinSysPathSysFile),\$ (DLLSelfRegister),,8/4/04 4:00:00  
AM,553472,5.1.2600.2180  
File7=@msvbvm60.dll,\$(WinSysPathSysFile),\$ (DLLSelfRegister),,8/4/04 4:00:00  
AM,1392671,6.0.96.90

[IconGroups]

Group0=Switching system  
PrivateGroup0=True  
Parent0=\$(Programs)

[Switching system]

Icon1="6relay.EXE"  
Title1=Switching system  
StartIn1=\$(AppPath)

[Setup]

Title=CONTROL  
DefaultDir=\$(ProgramFiles)\Project1  
AppExe=6relay.EXE  
AppToUninstall=6relay.EXE

[Setup1 Files]

File1=@MSCOMM32.OCX,\$(WinSysPath),\$ (DLLSelfRegister),\$ (Shared),6/23/98  
11:00:00 PM,103744,6.0.81.69  
File2=@6relay.exe,\$(AppPath),,\$ (Shared),12/9/07 7:45:56 AM,28672,1.0.0.0

[Bootstrap]

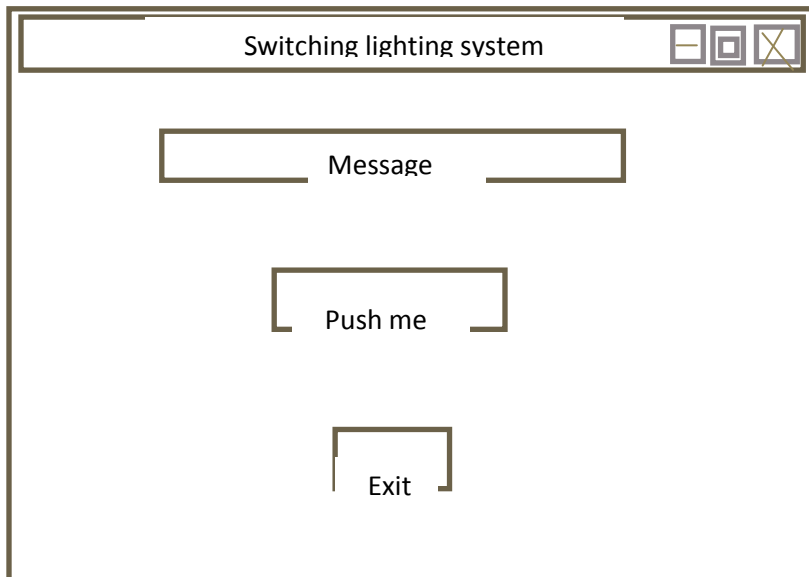
SetupTitle=Install  
SetupText=Copying Files, please stand by.  
CabFile=6relay.CAB  
Spawn=Setup1.exe

Uninstal=st6unst.exe  
TmpDir=msftqws.pdw  
Cabs=1

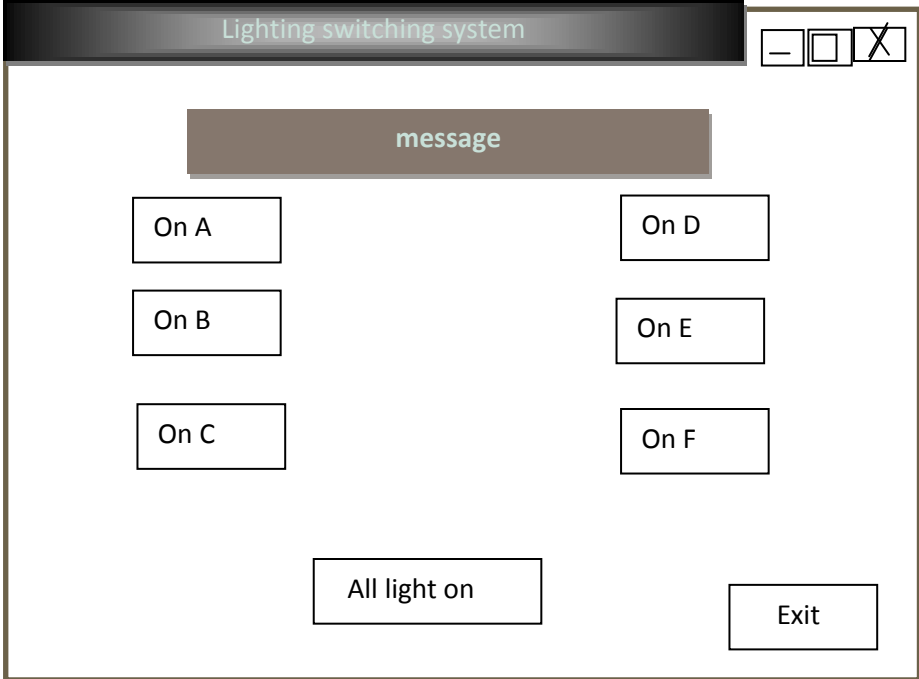
[Bootstrap Files]

File1=@VB6STKIT.DLL,\$(WinSysPathSysFile),,,6/17/98 11:00:00  
PM,102912,6.0.81.69  
File2=@COMCAT.DLL,\$(WinSysPathSysFile),\$ (DLLSelfRegister),,5/30/98 11:00:00  
PM,22288,4.71.1460.1  
File3=@stdole2.tlb,\$(WinSysPathSysFile),\$ (TLBRegister),,8/4/04 4:00:00  
AM,17920,3.50.5014.0  
File4=@asycfilt.dll,\$(WinSysPathSysFile),,,8/4/04 4:00:00  
AM,65024,5.1.2600.2180  
File5=@olepro32.dll,\$(WinSysPathSysFile),\$ (DLLSelfRegister),,8/4/04 4:00:00  
AM,83456,5.1.2600.2180  
File6=@oleaut32.dll,\$(WinSysPathSysFile),\$ (DLLSelfRegister),,8/4/04 4:00:00  
AM,553472,5.1.2600.2180  
File7=@msvbvm60.dll,\$(WinSysPathSysFile),\$ (DLLSelfRegister),,8/4/04 4:00:00  
AM,1392671,6.0.96.90

## MAIN MENU



# INPUT INTERFACE



# OUTPUT INTERFACE

