PERSONALISING AUTOMOBILE SETTINGS USING EMBEDDED SYSTEMS

A PROJECT REPORT

Submitted by

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BONAFIDE CERTIFICATE

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ABSTRACT

Automobiles, electric vehicles and hybrid vehicles are increasingly using embedded systems to maximize efficiency and reduce pollution. Other automotive safety systems such as anti-lock braking system (ABS), Electronic Stability Control (ESC), and automatic four-wheel drive also make use of embedded control

Embedded systems have become very important today as they control many of the common devices we use. An **embedded system** is a special-purpose computer system designed to perform one or a few dedicated functions, often with real-time computing constraints. It is usually *embedded* as part of a complete device including hardware and mechanical parts.

In very large institutions and organizations where there are a number of vehicles and drivers it is difficult to keep logging in the drivers who are on duty and are available. There are times when these details get mixed up leading to delays which could lead to disastrous consequences.

Often when a driver gets inside a car, he has to adjust the seating positions, the position of the rear view mirror, the roof top position, the cooling of the air conditioning, etc. for the optimum comfort while driving. These settings differ from person to person and have to be adjusted manually.

Security of the vehicles has become equally as important as the comforts that are being provided within the vehicle. It is an irony that thieves are well equipped these days. Hence it has become essential for the vehicle owners to protect their vehicles from the ever increasing number of thefts.

This project eliminates the need for manual adjustments, by using embedded systems to personalize the arrangements automatically in a ready-to-sit position when the door is opened. A simple solution to track and identify the driver who is currently using the vehicle is also provided in this project along with a security system that can prevent the vehicles from thefts.

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LIST OF SYMBOLS AND ABBREVIATIONS

NO.	SYMBOLS	ABBREVIATIONS
01	ABS	Anti-lock Braking System
02	ESC	Electronic Stability Control
03	RFID	Radio Frequency Identification
04	IR	Infra Red
05	RF	Radio Frequency
06	IC	Integrated Circuit
07	CMOS	Complementary Metal Oxide Semiconductor
08	EEPROM	Electrically Erasable Programmable Memory
09	NO	Normally Open
10	NC	Normally Closed
11	EMF	Electro Motive Force
12	AC	Alternating Current
13	COM	Common Pin
14	LCD	Liquid Crystal Display
15	LED	Light Emitting Diode
16	SCU	Security Control Unit
17	PC	Personal Computer
18	CPU	Central Processing Unit
19	I/O	Input Output
20	A/D	Address/Data
21	EIA	Electronic Industries Alliance
22	DTE	Data Terminal Equipment
23	DCE	Data Circuit-Terminating Equipment
24	UART	Universal Asynchronous Receiver Transmitter
25	Op-amp	Operational Amplifier
26	RMS	Root Mean Square
27	A/C	Air Condition

CHAPTER 1

INTRODUCTION

1. INTRODUCTION

Transportation systems from flight to automobiles prefer automation in production, implementation, navigation, etc. which increasingly use embedded systems. New airplanes contain advanced avionics such as inertial guidance systems, Global Positioning System (GPS) receivers and also considerable safety requirements.

Automobiles, electric vehicles and hybrid vehicles are increasingly using embedded systems to maximize efficiency and reduce pollution. Other automotive safety systems such as anti-lock braking system (ABS), Electronic Stability Control (ESC), and automatic four-wheel drive also make use of embedded control

Embedded systems have become very important today as they control many of the common devices we use. An **embedded system** is a special-purpose computer system designed to perform one or a few dedicated functions, often with real-time computing constraints. It is usually *embedded* as part of a complete device including hardware and mechanical parts.

1.1 NEED FOR THE PROJECT:

Often when a driver gets inside a car, he has to adjust the seating positions, the position of the rear view mirror, the roof top position, the cooling of the air conditioning, etc. for the optimum comfort while driving. These settings differ from person to person.

For example, it is difficult for a highly obese person to get inside the car if the previous driver had moved the seat very close to the steering wheel. The drivers have to change the angle of the mirror position depending on their heights.

In very large institutions and organizations where there are a number of vehicles and drivers it is difficult to keep logging in the drivers who are on duty and are available. There are times when these details get mixed up leading to delays which could lead to disastrous consequences.

Security of the vehicles has become equally as important as the comforts that are being provided within the vehicle. It is an irony that thieves are well equipped these days.

Hence it has become essential for the vehicle owners to protect their vehicles from the ever increasing number of thefts.

1.2 OBJECTIVE OF THE PROJECT:

- In modern days, large organizations need to identify the drivers and vehicles presently in use. To know the identification of the available drivers from a large group of drivers in large organizations our project aims to provide a solution by making use of **Radio Frequency Identification (RFID)** tags.

- Our project aims to make use of **embedded control** to automate the settings of a car even before the driver settles inside the car, which usually the driver has to change manually until he/she is comfortable.

- This project tries to make use of **Infra Red (IR) Security** which is one of the most reliable security mechanisms used in many places, to prevent any theft attempts of the vehicle, making the car secure at any place and at any time.

1.3 OUTLINE OF THE REPORT:

CHAPTER 1: INTRODUCTION OF THE PROJECT

Explains the need for the project and the objective of the project

CHAPTER 2: DRIVER TRACKING & IDENTIFICATION

Provides an insight about the working of the RFID driver identification and tracking.

CHAPTER 3: PERSONALIZING CAR SETTINGS

Gives the working of the changes that take place automatically inside the car.

CHAPTER 4: SECURITY FROM THEFT

The security provided for the vehicle is explained in this section.

CHAPTER 5: CONTROL UNIT

The complete working of the control unit is explained in this section.

CHAPTER 6: INTERFACING WITH PC

Gives the explanation of how the pc is interfaced with the project.

CHAPTER 7: HARDWARE FABRICATION & IMPLEMENTATION

Explains the complete operation of the project

CHAPTER 8: CONCLUSION

The project done and the scope for future work are discussed.

APPENDIX I: The program which controls the project is detailed.

APPENDIX II: Gives the features and the specification of the different ICs used.

CHAPTER 2

DRIVER TRACKING & IDENTIFICATION

2. DRIVER TRACKING & IDENTIFICATION

2.1 INTRODUCTION

Identifying the driver and the vehicle currently available when the numbers are high for both is a very tiresome and monotonous work. This work is usually done by writing down the name of the driver and the vehicle number. It takes time to keep track each and every driver, if the number of drivers is high, like in a large organization.

In our project, we make use of **Radio-Frequency Identification** (RFID) tags which is assigned to each driver. The block diagram below depicts the operation of the RFID system.

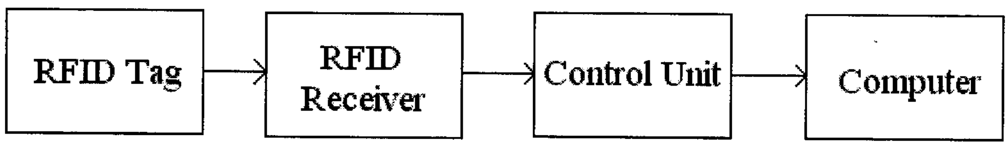


Fig 2.1: Block Diagram of RFID Tracking & Identification

2.2 RADIO FREQUENCY IDENTIFICATION:

RFID is an automatic identification method, relying on storing and remotely retrieving data using devices called RFID tags or transponders. It does it through wireless transfer of data between the RFID reader and the RFID tags using Radio Frequency (RF).

The frequency ranges distinguish RFID systems. Low-frequency (30 KHz to 500 KHz) systems have short reading ranges and lower system costs. They are most commonly used in security access, asset tracking, and animal identification applications. High-frequency (850 MHz to 950 MHz and 2.4 GHz to 2.5 GHz) systems, offering long read ranges (greater than 90 feet) and high reading speeds, are used for such applications as car tracking and automated toll collection.

2.2.1 MAIN COMPONENTS

- Integrated Circuit(IC) for storing and processing information
- Modulator and a demodulator of Radio Frequency(RF) signal
- Antenna for receiving and transmitting the RF signal

2.2.2 TYPES OF RFID TAGS

RFID tags come in three general varieties: *passive*, *active*, or *semi-passive* (also known as *battery-assisted*). Passive tags require no internal power source, thus being pure passive devices (they are only active when a reader is nearby to power them), whereas semi-passive and active tags require a power source, usually a small battery.

The **advantages** of a passive tag are:

- The tag functions without a battery; these tags have a useful life of twenty years or more.
- The tag is typically much less expensive to manufacture
- The tag is much smaller (some tags are the size of a grain of rice). These tags have almost unlimited applications in consumer goods and other areas.
- Tags can be read through a variety of substances such as snow, fog, ice, paint, crusted grime, and other visually and environmentally challenging conditions, where barcodes or other optically read technologies would be useless.
- RFID tags can also be read in challenging circumstances at remarkable speeds, in most cases responding in less than 100 milliseconds (ms).

Due to the above advantages of a passive tag, in this project we make use of a passive RFID tag and reader, the IC AN680.

2.2.3 PASSIVE TAG AND READER

Passive tags are those energized by the reader itself, they contain no power source, typically have very long lifetimes (near indefinite) a drawback over active tags is the read range, typically 2cm (1in) to 1.5m (4.5 ft), a strong positive is individual tag cost. RFID Passive tag is composed of an integrated electronic chip and an antenna coil that includes basic modulation circuitry and non-volatile memory.

Passive RFID tags have no internal power supply. The minute electrical current induced in the antenna by the incoming radio frequency signal provides just enough power for the Complementary metal–oxide–semiconductor (CMOS) IC in the tag to power up and transmit a response. Most passive tags signal by backscattering the carrier wave from the reader. This means that the antenna has to be designed both to collect power from the incoming signal and also to transmit the outbound backscatter signal. The response of a passive RFID tag is not necessarily just an ID number; the tag chip can contain non-volatile, possibly writable Electrically Erasable Programmable Memory (EEPROM) for storing data.

For most general applications passive tags are usually the most cost effective. These are made in a wide variety of sizes and materials: there are durable plastic tags for discouraging retail theft, wafer thin tags for use within "smart" paper labels, tiny tracking tags which are inserted beneath an animal's skin and credit card sized tags for access control. In most cases the amount of data storage on a passive tag is fairly limited - capacity often being measured in bits as opposed to bytes.

However for most applications only a relatively small amount of data usually needs to be codified and stored on the tag, so the limited capacity does not normally pose a major limitation. Most tags also carry an unalterable unique electronic serial number, which makes RFID tags potentially very useful in applications where item tracking is needed or where security aspects are important.

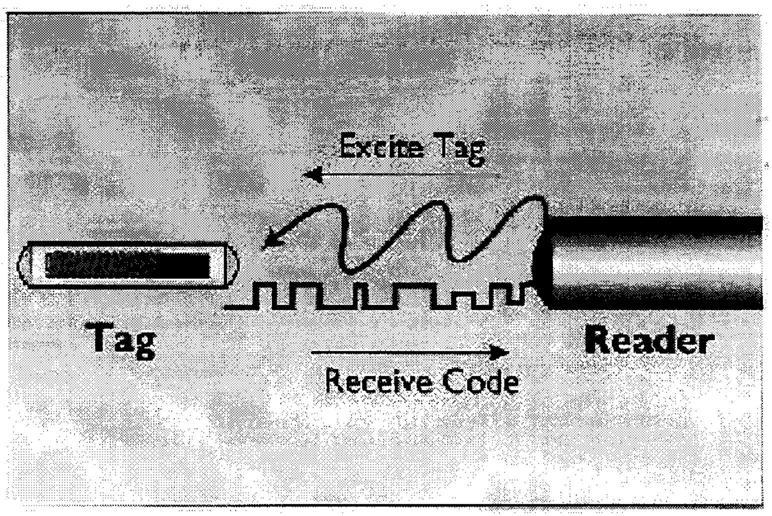


Fig 2.2 Interaction between tag and reader

The reader powers the tag (transponder), by emitting a radio frequency wave. The tag then responds by modulating the energizing field. This modulation can be decoded to yield the tags unique code, inherent in the tag. The resultant data can be the passed to a computer from processing. Tags have various salient features apart from their physical size: Other available features are: Read Only, Read Write, Anti-Collision.

2.2.4 OPERATING PRINCIPLES OF RFID SYSTEMS

There are a huge variety of different operating principles for RFID systems. The most important principle is inductive coupling, which is described in detail below.

Inductive coupling

An inductively coupled transponder comprises of an electronic data-carrying device, usually a single microchip and a large area coil that functions as an antenna.

Inductively coupled transponders are almost always operated passively. This means that all the energy needed for the operation of the microchip has to be provided by the reader. For this purpose, the reader's antenna coil generates a strong, high frequency electro-magnetic field, which penetrates the cross-section of the coil area and the area around the coil. Because the wavelength of the frequency range used (< 135 kHz: 2400 m, 13.56 MHz: 22.1 m) is several times greater than the distance between the reader's antenna and the transponder, the electro-magnetic field may be treated as a simple magnetic alternating field with regard to the distance between transponder and antenna.

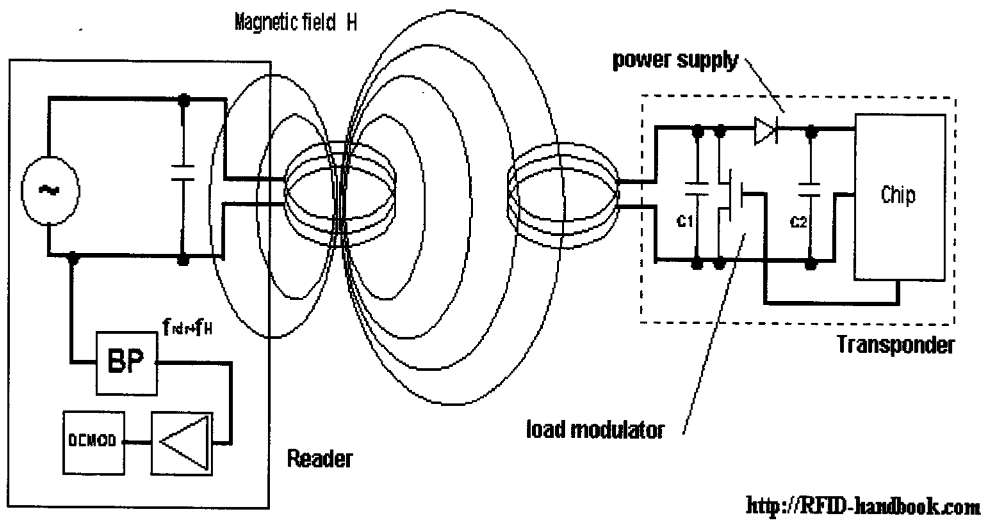


Fig 2.3: Inductive Coupling

A small part of the emitted field penetrates the antenna coil of the transponder, which is some distance away from the coil of the reader. By induction, a voltage Vi is generated in the transponder's antenna coil. This voltage is rectified and serves as the power supply for the data-carrying device (microchip). A capacitor C1 is connected in parallel with the reader's antenna coil, the capacitance of which is selected such that it combines with the coil inductance of the antenna coil to form a parallel resonant circuit, with a resonant frequency that corresponds with the transmission frequency of the reader. Very high currents are generated in the antenna coil of the reader by resonance step-up in the parallel resonant circuit, which can be used to generate the required field strengths for the operation of the remote transponder.

The antenna coil of the transponder and the capacitor C1 to form a resonant circuit tuned to the transmission frequency of the reader. The voltage V at the transponder coil reaches a maximum due to resonance step-up in the parallel resonant circuit.

As described above, inductively coupled systems are based upon a transformer-type coupling between the primary coil in the reader and the secondary coil in the transponder. This is true when the distance between the coils does not exceed 0.16 times the wavelength, so that the transponder is located in the near field of the transmitter antenna.

The switching on and off of a load resistance at the transponder's antenna therefore effects voltage changes at the reader's antenna and thus has the effect of an amplitude modulation of the antenna voltage by the remote transponder. If the switching on and off of the load resistor is controlled by data, then this data can be transferred from the transponder to the reader. This type of data transfer is called load modulation.

Backscatter Modulation

This terminology refers to the communication method used by a passive RFID tag to send data back to the reader. By repeatedly shunting the tag coil through a transistor, the tag can cause slight fluctuations in the reader's RF carrier amplitude.

The RF link behaves essentially as a transformer; as the secondary winding (tag coil) is momentarily shunted and the primary winding (reader coil) experiences a momentary voltage drop. The reader must peak-detect this data at about 60 decibel (dB) down (about 100 mV riding on a 100V sine wave) as shown in Figure.

This amplitude-modulation loading of the reader's transmitted field provides a communication path back to the reader. The data bits can then be encoded or further modulated in a number of ways.

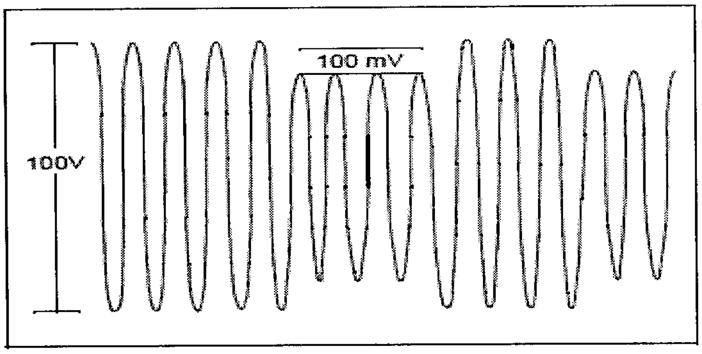


Fig 2.4: Amplitude – Modulated Backscattering Signal

To reclaim the data in the reader, the voltage measured at the reader's antenna is rectified. This represents the demodulation of an amplitude-modulated signal.

The IC AN680 has the following technical specifications, hence the most appropriate for our project. The datasheets have been enclosed in the appendix.

2.3 TECHNICAL SPECIFICATIONS:

Frequency:	125 KHz Read/Write
Distance:	Up to 6m (with mounted antenna)
Dimensions:	0.8mm diameter
Weight:	6-54g
Memory:	Up to 16 Kbits

CHAPTER 3

PERSONALIZING CAR SETTINGS

3. PERSONALIZING CAR SETTINGS

3.1 INTRODUCTION

In most of the modern cars the adjustments of the seat position and the other settings are adjusted manually. These changes of settings each and every time when different drivers occupy the seats is difficult. If these settings can be automated it would be of great advantage to the drivers.

The block diagram of the automation of the settings is shown below:

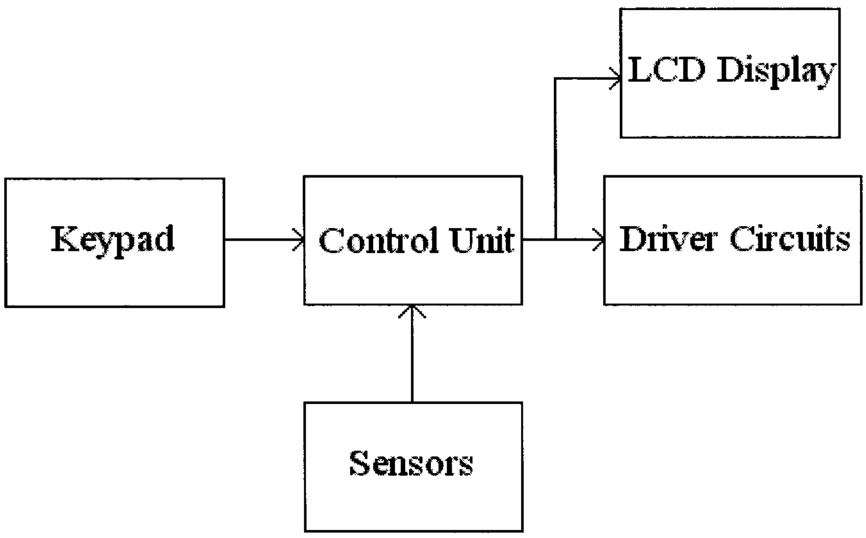


Fig 3.1: Block Diagram of Car Settings

When the driver shows the RFID tag the control unit identifies the driver and adjusts the settings inside the car that has been stored in memory corresponding to the RFID tag which has been used. The driver can change the values of the position any time through an external keypad. The new values will be updated in the memory and is used whenever the tag is used again.

The changes in the position of the seating are performed by controlled movement of the dc motors. The positions are kept track with the help of proximity the sensors. The complete operation is explained.

3.2 DRIVER CIRCUITS

The driver circuits are used to operate the dc motors which control the movement of the seat and mirror positions. The dc motor driver circuit performs forward and reverse control through a combination of transistors and relays. The driver circuit enables the rotation of the dc motor in the forward or reverse direction according to the value that is stored in the memory corresponding to the RFID tag.

3.2.1 DC MOTOR FORWARD & REVERSE CONTROL

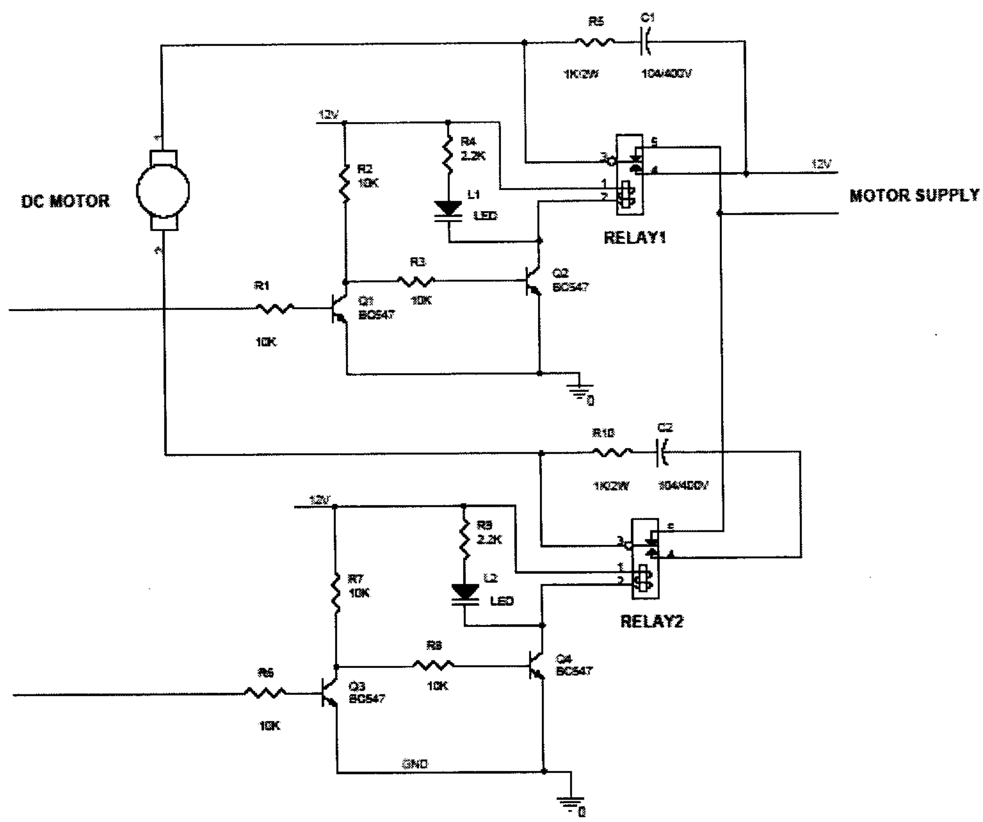


Fig 3.2: DC Motor Forward & Reverse Control

Circuit working Description:

This circuit is designed to control the motor in the forward and reverse direction. It consists of two relays named as relay1, relay2. The relay ON and OFF is controlled by the pair of switching transistors. The common pins of two relays are connected to positive and negative terminal of motor through snubber circuit respectively. The series combination of resistor and capacitor is called a snubber circuit. The relays are connected in the collector terminal of the transistors T2 and T4.

When high pulse signal is given to either base of the T1 or T3 transistors, the transistor is conducting and shorts the collector and emitter terminal and zero signals is given to base of the T2 or T4 transistor. So the relay is in the turned OFF state.

When low pulse is given to either base of transistor T1 or T3 transistor, the transistor is turned OFF. Now 12v is given to base of T2 or T4 transistor so the transistor is conducting and relay is turn ON. The NO and NC pins of two relays are interconnected so only one relay can be operated at a time.

Voltage Signal from Microcontroller or PC	Transistor Q1	Transistor Q2	Relay1
1	On	off	off
0	Off	on	on

Table 3.1: Switching States of Relay1

When the relay is turn ON and turn OFF continuously, the back electro-motive force (emf) may damage the relays. So the back emf is grounded through the snubber circuit.

- When relay 1 is in the ON state and relay 2 is in the OFF state, the motor is running in the forward direction.
- When relay 2 is in the ON state and relay 1 is in the OFF state, the motor is running in the reverse direction.

3.2.2 WORKING OF RELAY UNIT:

Relay:

A relay is an electrically operated switch. Current flowing through the coil of the relay creates a magnetic field which attracts a lever and changes the switch contacts. The coil current can be on or off so relays have two switch positions and they are double throw (changeover) switches. Relays allow one circuit to switch a second circuit which can be completely separate from the first. For example a low voltage battery circuit can use a relay to switch a 230V Alternating Current (AC) mains circuit. There is no electrical connection inside the relay between the two circuits; the link is magnetic and mechanical.

The coil of a relay passes a relatively large current, typically 30mA for a 12V relay, but it can be as much as 100mA for relays designed to operate from lower voltages. Most ICs cannot provide this current and a transistor is usually used to amplify the small IC current to the larger value required for the relay coil. The maximum output current for the popular 555 timer IC is 200mA. So these devices can supply relay coils directly without amplification.

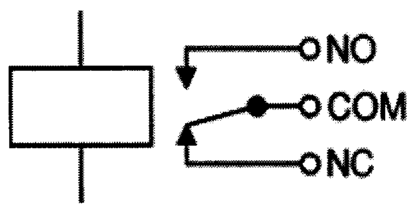


Fig 3.3: Relay's Switch Connections

The relay's switch connections are usually labeled COM, NC and NO:

- **COM** = Common, always connect to this. It is the moving part of the switch.
- **NC** = Normally Closed, COM is connected to this when the relay coil is **off**.
- **NO** = Normally Open, COM is connected to this when the relay coil is **on**.

Circuit description:

This circuit is designed to control the load. The load may be motor or any other load. The load is turned ON and OFF through relay. The relay ON and OFF is controlled by the pair of switching transistors (BC 547). The relay is connected in the Q2 transistor collector terminal.

The relay common pin is connected to supply voltage. The normally open (NO) pin is connected to load. When high pulse signal is given to base of the Q1 transistors, the transistor is conducting and shorts the collector and emitter terminal. Zero signal is given to base of the Q2 transistor. So the relay is in the turned OFF state.

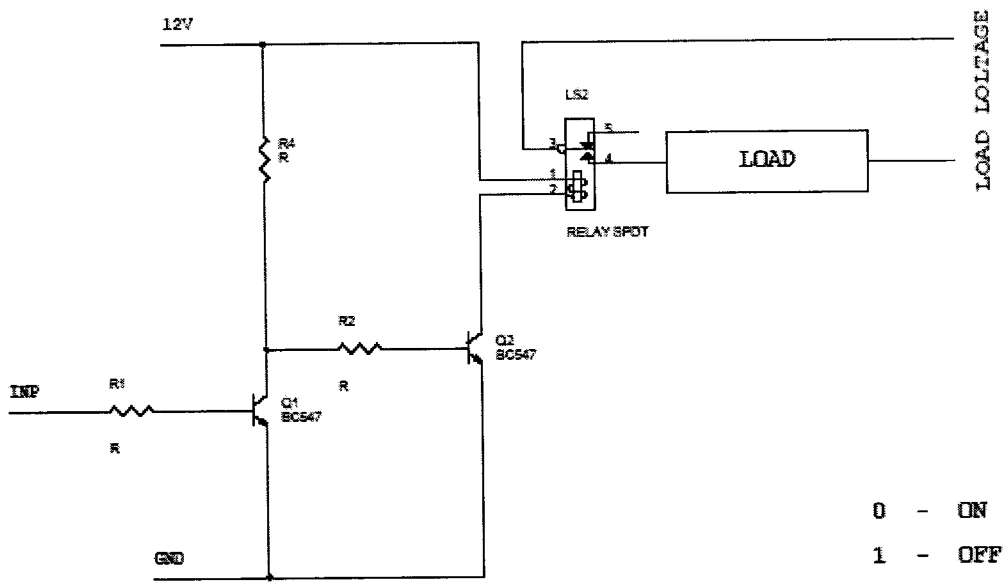


Fig 3.4: Circuit Description of Relay Unit

When low pulse is given to base of transistor Q1 transistor, the transistor is turned OFF. Now 12v is given to base of Q2 transistor so the transistor is conducting and relay is turned ON. Hence the common terminal and NO terminal of relay are shorted. Now load gets the supply voltage through relay.

3.3 LIQUID CRYSTAL DISPLAY (LCD)

The LCD helps in displaying the values currently set to the driver. When the RFID tag is shown the first time, a message is displayed for a few seconds showing "Show Card to Change Settings". When the card is shown again after the initial detection, the user can change the values (position of the seats, mirror, etc.) through an external keypad. The change in the values is displayed in the LCD display unit.

Liquid crystal displays (LCDs) have materials, which combine the properties of both liquids and crystals. Rather than having a melting point, they have a temperature range within which the molecules are almost as mobile as they would be in a liquid, but are grouped together in an ordered form similar to a crystal.

An LCD consists of two glass panels, with the liquid crystal material sandwiched in between them. The inner surface of the glass plates are coated with transparent electrodes which define the character, symbols or patterns to be displayed polymeric layers are present in between the electrodes and the liquid crystal, which makes the liquid crystal molecules to maintain a defined orientation angle.

One polarizer each is pasted outside the two glass panels. These polarizer would rotate the light rays passing through them to a definite angle, in a particular direction. When the LCD is in the off state, light rays are rotated by the two polarizes and the liquid crystal, such that the light rays come out of the LCD without any orientation, and hence the LCD appears transparent.

When sufficient voltage is applied to the electrodes, the liquid crystal molecules would be aligned in a specific direction. The light rays passing through the LCD would be rotated by the polarizer, which would result in activating / highlighting the desired characters. The LCD's are lightweight with only a few millimeters thickness. Since the LCD's consume less power, they are compatible with low power electronic circuits, and can be powered for long durations.

The LCD does not generate light and so light is needed to read the display. By using backlighting, reading is possible in the dark. The LCD's have long life and a wide operating temperature range. Changing the display size or the layout size is relatively simple which makes the LCD's more customers friendly.

3.4 PROXIMITY SENSORS

The inductive proximity sensor detects all metals with its high-frequency electro-magnetic field. In automated processes, sensors are used to provide signals on positions and limits, serve as pulse pick-ups for counting tasks or for monitoring rotational speed. Inductive proximity sensors are indispensable for these types of applications.

As compared to mechanical devices, they offer ideal features: non-contact detection of all metals, high switching frequencies, accuracy, and durability in the most aggressive environments

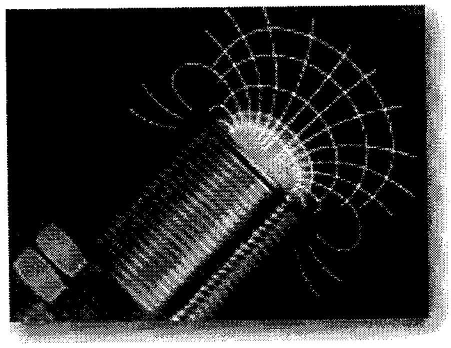


Fig 3.5: Proximity Sensor Field

They are insensitive to vibration, dust, and moisture. Proximity sensors can have a high reliability and long functional life because of the absence of mechanical parts and lack of physical contact between sensor and the sensed object.

3.4.1 OPERATING PRINCIPLE

An inductive proximity sensor contains four essential components: a coil of wire wrapped in a ferrite core, an oscillator circuit, an evaluation circuit, and an output circuit.

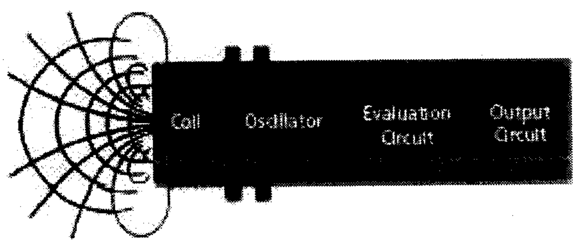


Fig 3.6: Components inside Proximity Sensor

When voltage is applied to the sensor, an oscillating current flows through the coil and radiates an electromagnetic field from the active face of the sensor. This field is directed and shaped by the ferrite core.

Inductive proximity sensors take advantage of changes in a resonant circuit caused by eddy current losses in conductive materials. The target, while entering the electromagnetic field produced by the coil, will decrease the oscillations due to eddy currents developed in the target. If the target approaches the sensor within the so-called "sensing range", the oscillations cannot be produced anymore: eddy currents are drawn from the oscillator and induced into the target. These eddy currents draw energy from the electromagnetic field. The losses in energy caused by the eddy currents are due to the conductivity and permeability of the target, the distance and position of the target, and the size and shape of the target.

When the metal target is positioned at a precise distance from the active face of the sensor, the energy loss caused by the eddy currents becomes so large that the amplifier cannot output sufficient energy to maintain oscillation and the magnetic field collapses. The breakdown in oscillation is detected by the evaluation circuit, which then changes the state of the output circuit thus giving a pulse to the microcontroller.

The proximity sensors thus give a feedback to the microcontroller on the position of the seat and mirror position enabling the automation of the changes in alignment.

CHAPTER 4

SECURITY FROM THEFT

4. SECURITY FROM THEFTS

4.1 INTRODUCTION

Automobiles have a substantial monetary value and they have always been attractive targets for criminals and thieves. They can use the stolen cars in fraud, theft, forgery, extortion, bribery or other similar criminal activities.

Characteristic for criminal organizations is, that they have considerable resources available and are prepared to use all means necessary to achieve their goals, if they expect the benefit to be substantial enough. But also more conventional criminals can be a major threat to information security. For example, a common car thief can get access to important data, if that data is stored in unprotected form in the automobile.

Various security devices have been designed for preventing unauthorized use of automobiles. The known security devices are generally mechanical in nature such as the locks for blocking the steering columns of automobiles. Some people also install hidden electrical switches in utilization circuits such as the ignition circuit in order to prevent their energization. However, the mechanical locks can be rendered ineffective and the simple electrical switches localized and neutralized.

Infrared (IR) security provides a number of advantages over the conventional security systems and hence we use it in our project. The following block diagram explains the operation.

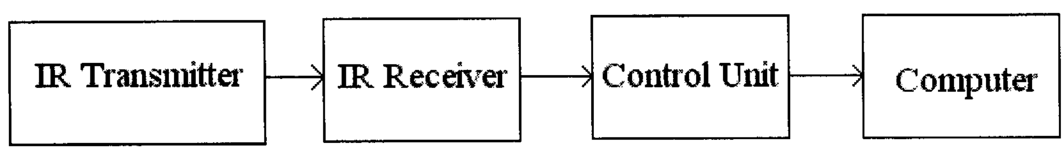


Fig 4.1: Block Diagram of IR Security

4.2 IR SECURITY

IR transmission refers to energy in the region of the electromagnetic radiation spectrum at wavelengths longer than those of visible light, but shorter than those of micro waves and radio waves as shown in the figure.

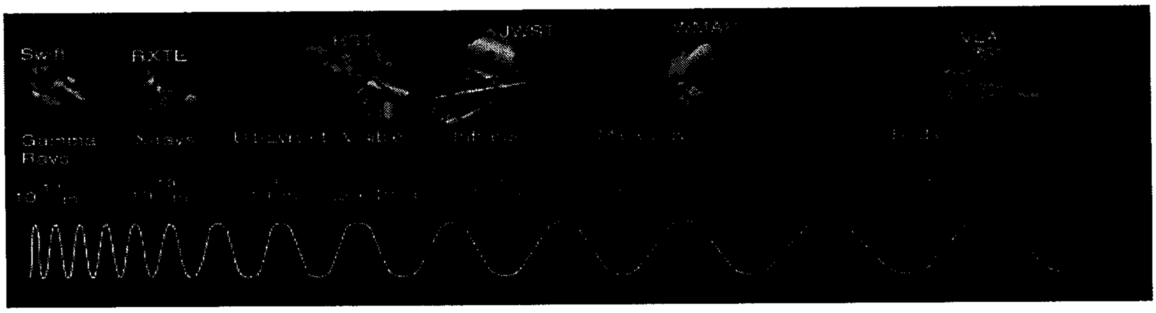


Fig 4.2: IR Spectrum Position

The infrared radiation (IR) spectrum is divided into three regions. The wavelengths are specified in microns (symbolized μ, where 1 μ = 10^{-6} meter) or in nanometers (abbreviated nm, where 1 nm = 10^{-9} meter = 0.001 5). The *near IR band* contains energy in the range of wavelengths closest to the visible, from approximately 750 to 1300 nm. The *intermediate IR band* consists of energy in the range 1300 to 3000 nm. The *far IR band* extends from 3000 nm to 1.4000 x 10^4 nm.

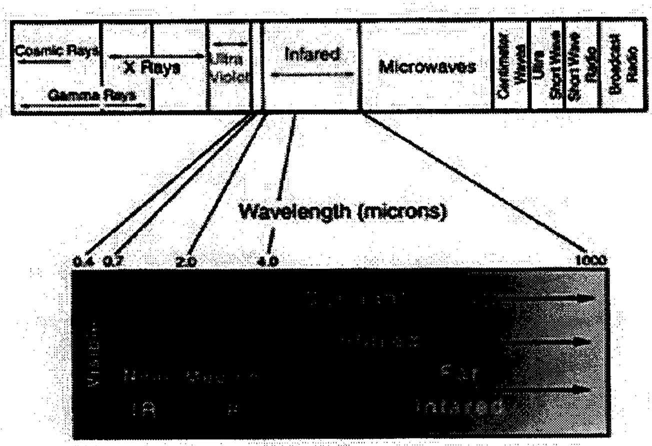


Fig 4.3: IR Spectrum

Infrared is used in a variety of applications in the fields of wireless communications, monitoring, and control applications like:

- Home-entertainment remote-control boxes
- Wireless (local area networks)
- Links between notebook computers and desktop computers
- Cordless modem

- Intrusion detectors
- Motion detectors
- Fire sensors
- Night-vision systems
- Medical diagnostic equipment
- Missile guidance systems
- Geological monitoring devices

4.3 IR ADVANTAGES:

1. Low power requirements
2. **Low circuitry costs:** $2-$5 for the entire coding/decoding circuitry
3. Simple circuitry: no special or proprietary hardware is required, can be incorporated into the integrated circuit very easily.
4. **Higher security:** directionality of the beam helps ensure that data isn't leaked or spilled to nearby devices as it's transmitted
5. **High noise immunity**: not as likely to have interference from signals from other devices.
6. They also present less risk of injury.
7. Widest bandwidth.
8. Multiple systems can be used without interference.
9. **Precise Control:** Electric Infrared emitters respond very quickly and can be controlled by microprocessors that quickly follow process changes.

Due to the above advantages an IR transmitter and receiver is used to provide the security to the vehicle.

4.4 IR TRANSMITTER & RECEIVER

Infrared transmitter is one type of Light Emitting Diode (LED) which emits infrared rays generally called as IR Transmitter. Similarly IR Receiver is used to receive the IR rays transmitted by the IR transmitter. One important point is both IR transmitter and receiver should be placed in a straight line.

The transmitted signal is given to IR transmitter. Whenever the signal is high, the IR transmitter LED is conducting and it passes the IR rays to the receiver. The IR receiver is connected with a comparator. The comparator is constructed with LM 741 operational amplifier. In the comparator circuit the reference voltage is given to inverting input terminal. The non- inverting input terminal is connected to the IR receiver.

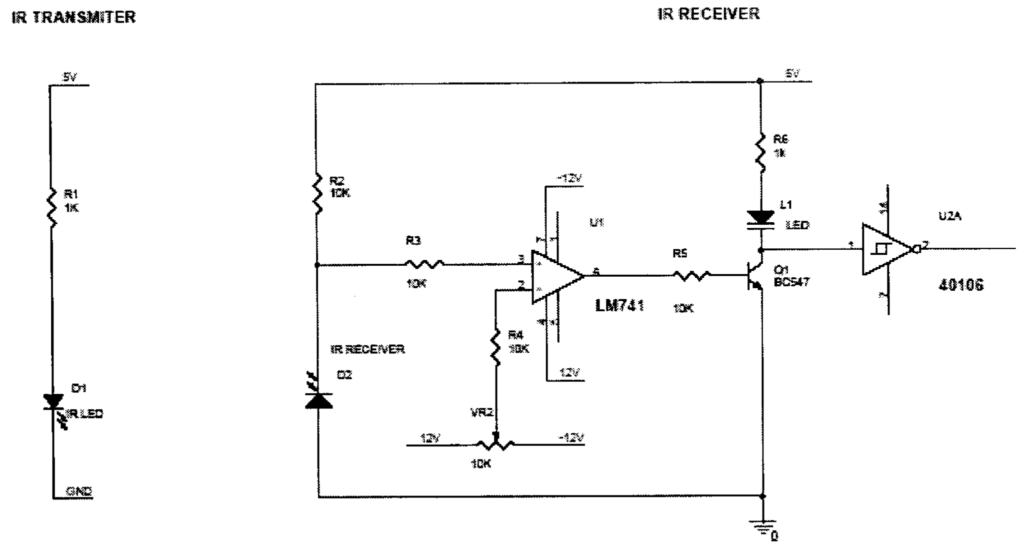


Fig 4.4: IR Transmitter & Receiver

When the IR rays are interrupted between the IR transmitter and receiver, the IR receiver is not conducting. So the comparator's non inverting input terminal voltage is higher than the inverting input. Now the comparator output is in the range of +12V. This voltage is given to base of the transistor Q1. Hence the transistor is conducting. Here the transistor is acting as a switch. So the collector and emitter will be closed. The output is taken from collector terminal. Now the output is zero.

When IR transmitter passes the rays to receiver, the IR receiver is conducting. Due to that non inverting input voltage is lower than inverting input. Now the comparator output is -12V so the transistor is in the cut-off region. The 5v is given to 40106 IC which is an inverter with buffer. The inverter output is given to microcontroller.

4.4.1 SECURITY CONTROL UNIT (SCU):

When the IR rays between the IR transmitter and receiver is interrupted by an unauthorized person, immediately the IR receiver triggers a security threat in the Personal Computer (PC). This is done by interfacing the SCU to the PC through a serial communication port RS232. The microcontroller on receiving the input pulse from IR security unit executes and displays the security threat.

CHAPTER 5

CONTROL UNIT

5. CONTROL UNIT

5.1 INTRODUCTION

The control unit as the name indicates controls all the operations that are taking place in the project. This unit makes sure that the operations take place in sequence. The control unit consists of a number ICs which when combined brings the overall control of the entire project. The general block diagram of the ICs and their interconnections are shown in the block diagram below:

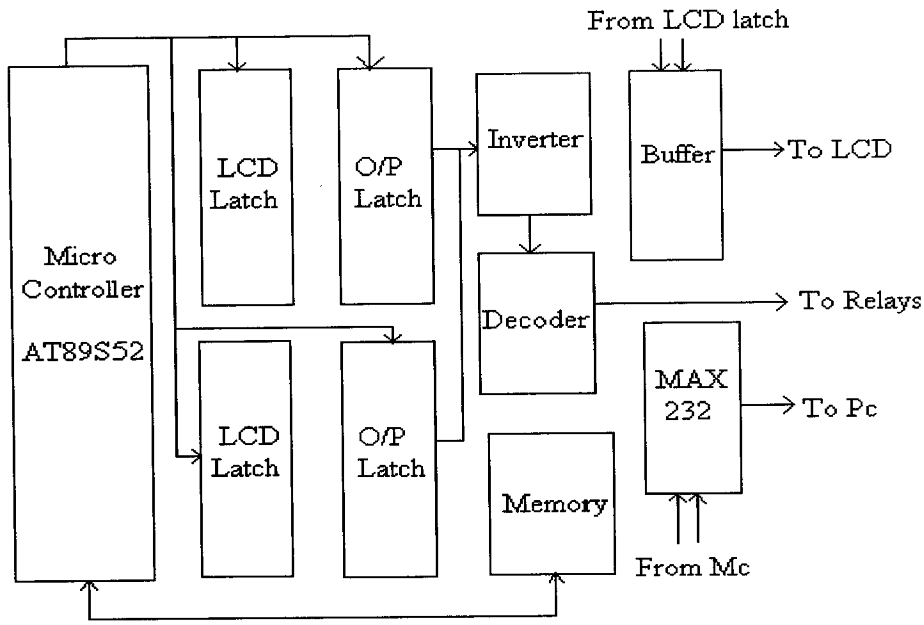


Fig 5.1: Block Diagram of Control Unit

5.2 MICROCONTROLLER AT89S52:

5.2.1 DESCRIPTION:

The AT89S52 is a low-power, high-performance CMOS 8-bit micro controller with 8K Bytes of in-system programmable Flash memory. The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the Industry-standard 80C51 instruction set and pin out. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer.

By combining a versatile 8-bit Central Processing Unit (CPU) with in-system programmable flash on a monolithic chip, the AT89S52 provides the following standard features: 8K bytes of Flash, 256 bytes of Random Access Memory (RAM), 32 Input/Output (I/O) lines, Watchdog timer, two data pointers, three 16-bit timer/counters, a six-vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator, and clock circuitry. The complete architecture of AT89S52 is shown below.

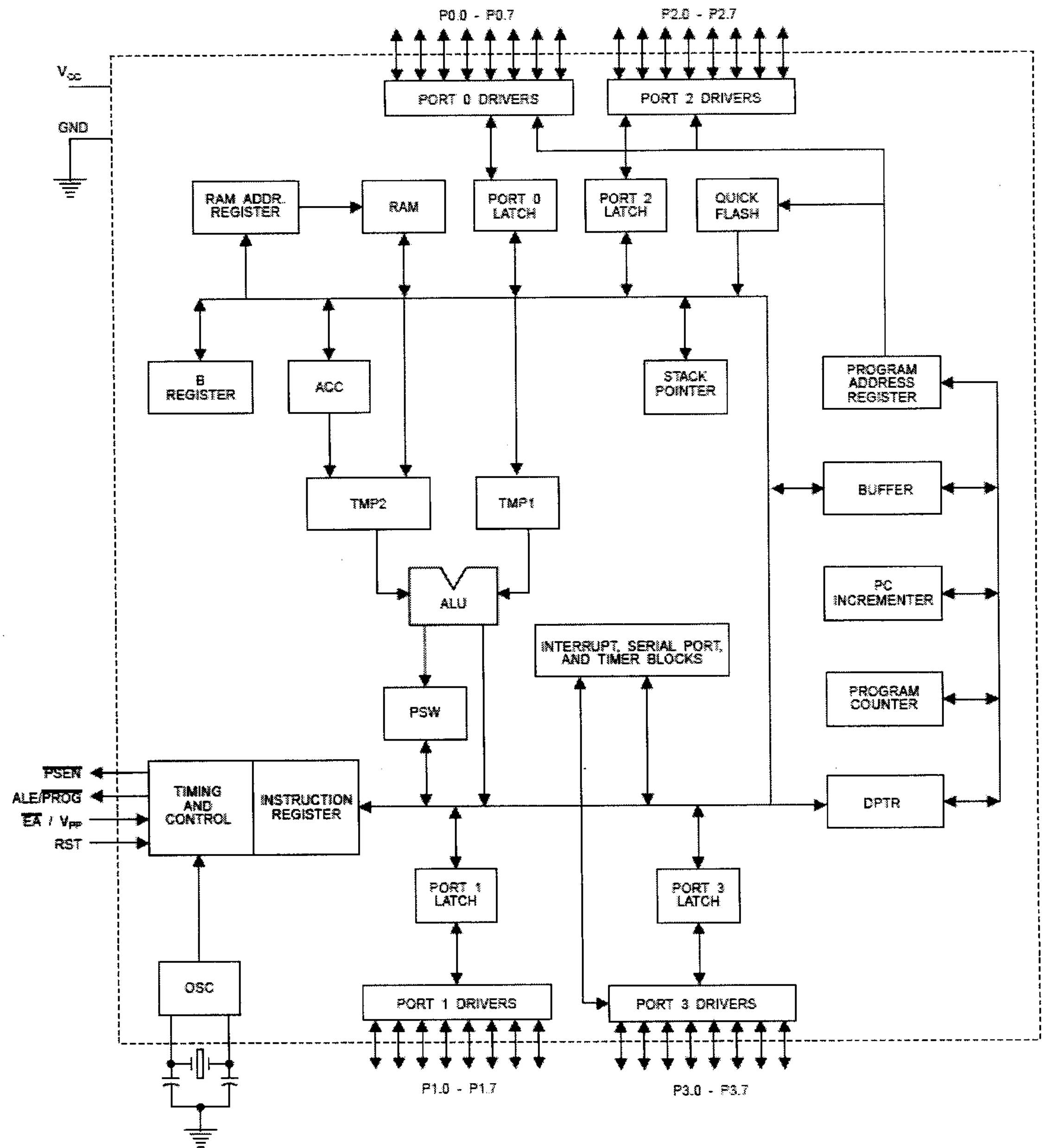


Fig 5.2: Complete Architecture of AT89C52

In addition, the AT89S52 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes. The Idle Mode stops the Central Processing Units (CPU) while allowing the RAM, timer/counters, serial port, and interrupt system to continue functioning. The Power-down mode saves the RAM contents but freezes the oscillator, disabling all other chip functions until the next interrupt or hardware reset.

Port 0:

Display of the settings inside the car is done using an LCD. The LCD latches required for this display unit is connected to the port 0 of the microcontroller. Hence port 0 enables the operation of the LCD display. Since port 0 is Address/Data (A/D) port the data is sent as A/D. This data is input to the LCD latches and the output latches.

Port 1:

The RFID reader module is used to transmit the modified RF signal to the port 1 of the microcontroller. This pulse contains the information of the RFID tag which has been used. The pulse also starts the execution of the program stored in the memory.

The port 1 is also used by the IR receiver unit to transmit any data regarding intrusion of the security system.

The clock oscillator and the reset circuit are also connected to the microcontroller through the port 1.

Port 2:

The port 2 is used to connect to the keypad matrix. A 5 key keypad is used and hence it occupies 5 of the pins in the port 2. The PC is interfaced with the microcontroller to display the identity and theft detection through the port 2.

Port 3:

The output driver circuits of the motors are connected to certain pins in the port 3.

The data sheets of the microcontroller AT89S52 is enclosed in the appendix.

5.3 OUTPUT CONDITIONING UNITS

The control unit is also interfaced with the following output conditioning ICs for its various operations.

5.3.1 74LS373: LCD LATCH

The output from port 0 is in the A/D form. Hence it is necessary to split the received bytes into address and data. This conversion is obtained by using two latches each for splitting into address and data separately. This converted address and data is stored in a buffer before being displayed in the LCD display unit.

5.3.2 74LS273: OUTPUT LATCH

The data from the microcontroller to the driver circuit is in the A/D form. Hence this signal is latched with the help of the 74LS273 IC. This latched output is inverted to boost the obtained signal before sending to the decoder.

5.3.3 74LS138: DECODER

The output from the inverter after the data from the microcontroller has been latched is decoded to obtain the correct value of the driver circuit that has to be operated in order to perform the specified operation in the program of the microcontroller.

5.3.4 EEPROM:

The EEPROM is a memory chip which is used to store the data. The microcontroller makes use of this IC to store the program and the different values which are set by the driver. This memory unit helps the microcontroller to retrieve the data of the positions correctly whenever an RFID tag is used.

5.3.5 MAX232:

The MAX 232 IC is used as a level logic converter. The MAX232 is a dual driver/receiver that includes a capacitive voltage generator to supply Electronic Industries Alliance (EIA) 232 voltage levels from a single 5v supply. Each receiver converts EIA-232 to 5v Transistor-transistor logic (TTL)/CMOS levels. Each driver converts TTL/CMOS input levels into EIA-232 levels.

Thus the control unit performs the important work of controlling the following operations that takes place during the execution of the program.

The program coding has been enclosed in the appendix.

CHAPTER 6

INTERFACING WITH PC

6. INTERFACING WITH PC

6.1 INTRODUCTION

The interfacing with the PC is done by making use of an RS232 serial communication port. Since the voltages are of 5V level a MAX232 IC is used to obtain the conversion from 5V to 12V needed for the PC.

6.2 RS232 COMMUNICATION

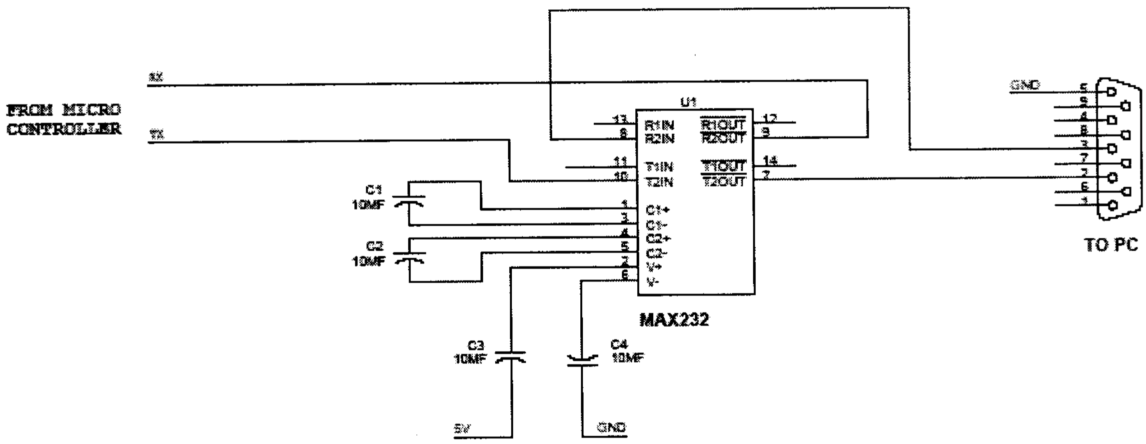


Fig 6.1: RS232 Communication

6.2.1 RS232:

In telecommunications, **RS-232** is a standard for serial binary data interconnection between Data terminal equipment (*DTE*) and a Data Circuit-terminating Equipment (*DCE*). It is commonly used in computer serial ports.

6.2.2 SCOPE OF THE STANDARD:

The Electronic Industries Alliance (EIA) standard RS-232-C [3] as of 1969 defines:

- Electrical signal characteristics such as voltage levels, signaling rate, timing and slew-rate of signals, voltage withstand level, short-circuit behavior, maximum stray capacitance and cable length
- Interface mechanical characteristics, pluggable connectors and pin identification
- Functions of each circuit in the interface connector
- Standard subsets of interface circuits for selected telecom applications

The standard does not define such elements as character encoding or the framing of characters in the data stream (bits per character, start/stop bits, parity). The standard does not define protocols for error detection or algorithms for data compression.

The standard does not define bit rates for transmission, although the standard says it is intended for bit rates lower than 20,000 bits per second. Many modern devices can exceed this speed (38,400 and 57,600 bit/s being common, and 115,200 and 230,400 bit/s making occasional appearances) while still using RS-232 compatible signal levels.

Details of character format and transmission bit rate are controlled by the serial port hardware, often a single integrated circuit called a universal asynchronous receiver transmitter (UART) that converts data from parallel to serial form. A typical serial port includes specialized driver and receiver integrated circuits to convert between internal logic levels and RS-232 compatible signal levels.

CIRCUIT WORKING DESCRIPTION:

In this circuit the MAX 232 IC used as level logic converter. The MAX232 is a dual driver/receiver that includes a capacitive voltage generator to supply EIA 232 voltage levels from a single 5v supply. Each receiver converts EIA-232 to 5v Transistor-transistor logic (TTL)/CMOS levels. Each driver converts TTL/CMOS input levels into EIA-232 levels.

Function Tables

EACH DRIVER

INPUT TIN	OUTPUT TOUT
L	H
H	L

H = high level, L = low level

EACH RECEIVER

INPUT RIN	OUTPUT ROUT
L	H
H	L

H = high level, L = low level

Table 6.1: Function Tables of MAX232

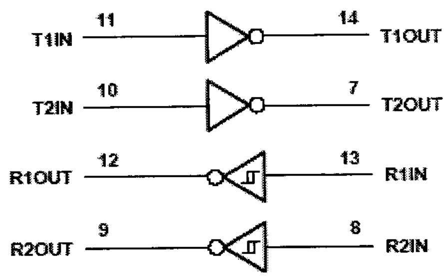


Fig 6.2: Logic Diagram (positive logic)

In this circuit the microcontroller transmitter pin is connected in the MAX232 T2IN pin which converts input 5v TTL/CMOS level to RS232 level. Then T2OUT pin is connected to receiver pin of 9 pin D type serial connector which is directly connected to PC.

In PC the transmitting data is given to R2IN of MAX232 through transmitting pin of 9 pin D type connector which converts the RS232 level to 5v TTL/CMOS level. The R2OUT pin is connected to receiver pin of the microcontroller. Likewise the data is transmitted and received between the microcontroller and PC or other device vice versa.

The PC is interfaced with our project to display the driver identification when the RFID tag is used. A security threat message is also displayed when the IR security is breached by an unauthorized person.

CHAPTER 7

HARDWARE FABRICATION & IMPLEMENTATION

7. HARDWARE FABRICATION & IMPLEMENTATION

7.1 INTRODUCTION

The overall block diagram of the project is presented here. When the supply is switched ON the microcontroller makes itself ready to receive the input from the **Radio-Frequency Identification** (RFID) reader. The RFID is an automatic identification method, relying on storing and remotely retrieving data using RFID tags or transponders.

The input to the microcontroller is from the signal obtained from the RFID reader when it identifies the correct RFID tag corresponding to a driver in the memory. It converts the signal obtained into corresponding electric signals. The electrical signals are in an incompatible form for the microcontroller. Hence it is given to the signal conditioning unit and converted into a compatible form. The unit consists of amplifiers, zero crossing detectors and switching transistors. The supply being 5V, the output will be pulses with amplitude of 5V.

The microcontroller on receiving the pulses is programmed to compare the RFID signal for authentication. After authentication the microcontroller starts the execution of the program, first by displaying the identification and details of the current driver in the PC. Then the microcontroller activates the relays based on the sequence of the program, thus activating the motor movement.

The dc motor will be stopped when the corresponding **proximity sensors** detect the position of the seat and mirror. When the sensors detect the preset position the microcontroller deactivates the relays accordingly. The settings change based on the difference in the RFID tag which is being used.

The positions can be changed by the driver according to his wish. Once changed the values are stored in an external memory and is reused when the same card is used again. In case an unauthorized person tries to open the door, the IR safety measure detects the presence and immediately warns the detection through the PC thus safeguarding any theft attempts.

The programming of the microcontroller is done in such a way that all the operations take place before the driver takes his position on the seat.

7.2 BLOCK DIAGRAM

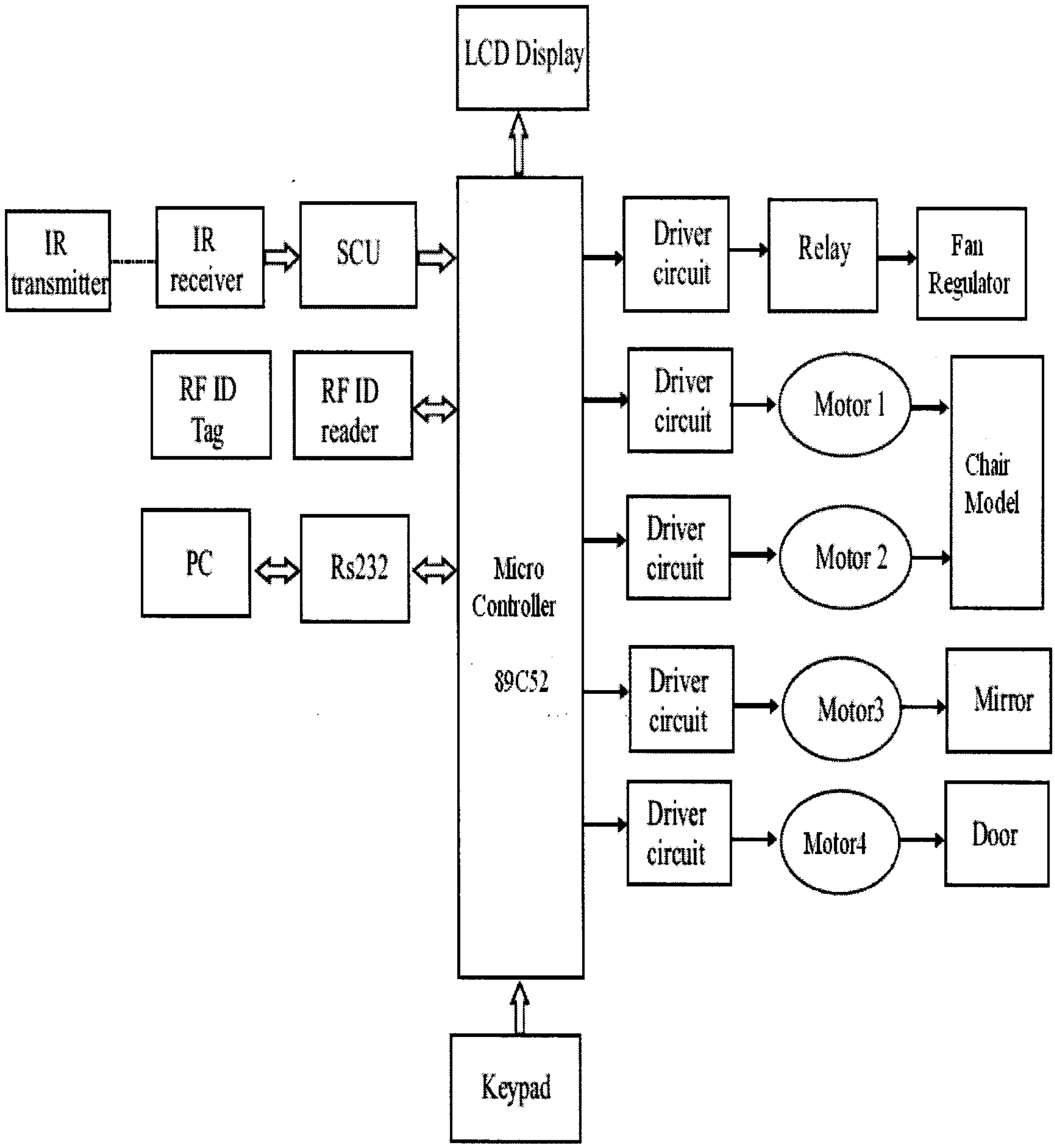


Fig 7.1: Overall Block Diagram

7.3 POWER SUPPLY

The ac voltage, typically 220V rms, is connected to a transformer, which steps that ac voltage down to the level of the desired dc 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. This resulting dc voltage usually has some ripple or ac voltage variation.

A regulator circuit removes the ripples and also remains the same dc value even if the input dc voltage varies, or the load connected to the output dc voltage changes. This voltage regulation is usually obtained using one of the popular voltage regulator IC units.

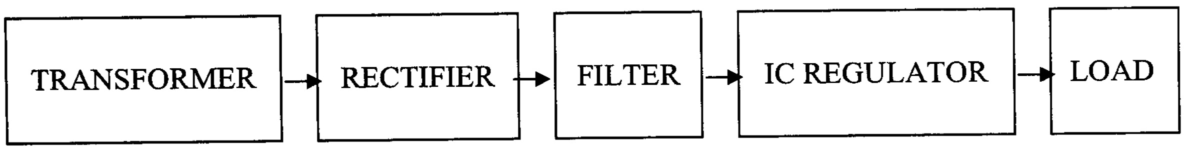


Fig 7.2: Block diagram (Power supply)

7.3.1 TRANSFORMER

The potential transformer will step down the power supply voltage (0-230V) to (0-6V) level. Then the secondary of the potential transformer will be connected to the precision rectifier, which is constructed with the help of op–amp. The advantages of using precision rectifier are it will give peak voltage output as DC, rest of the circuits will give only RMS output.

7.3.2 BRIDGE RECTIFIER

When four diodes are connected as shown in figure, the circuit is called as bridge rectifier. The input to the circuit is applied to the diagonally opposite corners of the network, and the output is taken from the remaining two corners.

There is a positive potential, at point A and a negative potential at point B. the positive potential at point A will forward bias D3 and reverse bias D4. The negative potential at point B will forward bias D1 and reverse D2. At this time D3 and D1 are forward biased and will allow current flow to pass through them; D4 and D2 are reverse biased and will block current flow.

One advantage of a bridge rectifier over a conventional full-wave rectifier is that with a given transformer the bridge rectifier produces a voltage output that is nearly twice that of the conventional full-wave circuit.

7.3.3 IC VOLTAGE REGULATORS

Voltage regulators comprise a class of widely used ICs. Regulator IC units contain the circuitry for reference source, comparator amplifier, control device, and overload protection all in a single IC. IC units provide regulation of either a fixed positive voltage, a fixed negative voltage, or an adjustably set voltage. The regulators can be selected for operation with load currents from hundreds of milli amperes to tens of amperes, corresponding to power ratings from milli watts to tens of watts.

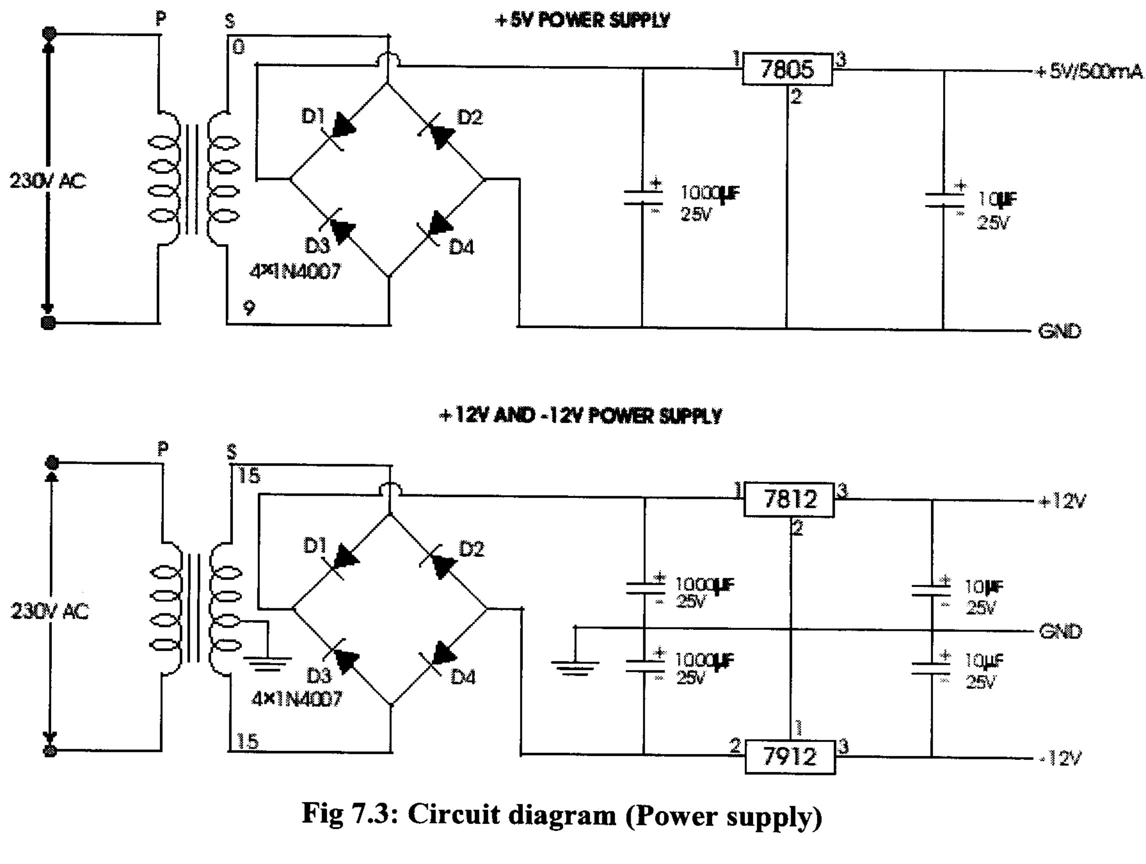


Fig 7.3: Circuit diagram (Power supply)

A fixed three-terminal voltage regulator has an unregulated dc input voltage, Vi, applied to one input terminal, a regulated dc output voltage, Vo, from a second terminal, with the third terminal connected to ground. The series 78 regulators provide fixed positive regulated voltages from 5 to 24 volts. Similarly, the series 79 regulators provide fixed negative regulated voltages from 5 to 24 volts.

- For ICs, microcontroller, LCD --------- 5 volts
- For alarm circuit, op-amp, relay circuits ---------- 12 volts

7.4 WORKING OF THE CIRCUIT

When an RFID tag is shown by the user, by repeatedly shunting the tag coil through a transistor, the tag can cause slight fluctuations in the reader's RF carrier amplitude.

The RF link behaves essentially as a transformer; as the secondary winding (tag coil) is momentarily shunted and the primary winding (reader coil) experiences a momentary voltage drop. The reader must peak-detect this data at about 60 decibel (dB) down (about 100 mV riding on a 100V sine wave). To reclaim the data in the reader, the voltage measured at the reader's antenna is rectified. This amplitude-modulation loading of the reader's transmitted field provides a communication path back to the reader. The data bits can then be encoded or further modulated or demodulated in a number of ways.

The output of the RFID reader is sent to the pin "P1.1" of the microcontroller and this output pulse is identified by the microcontroller and starts the execution of the program pertaining to the users of the tag.

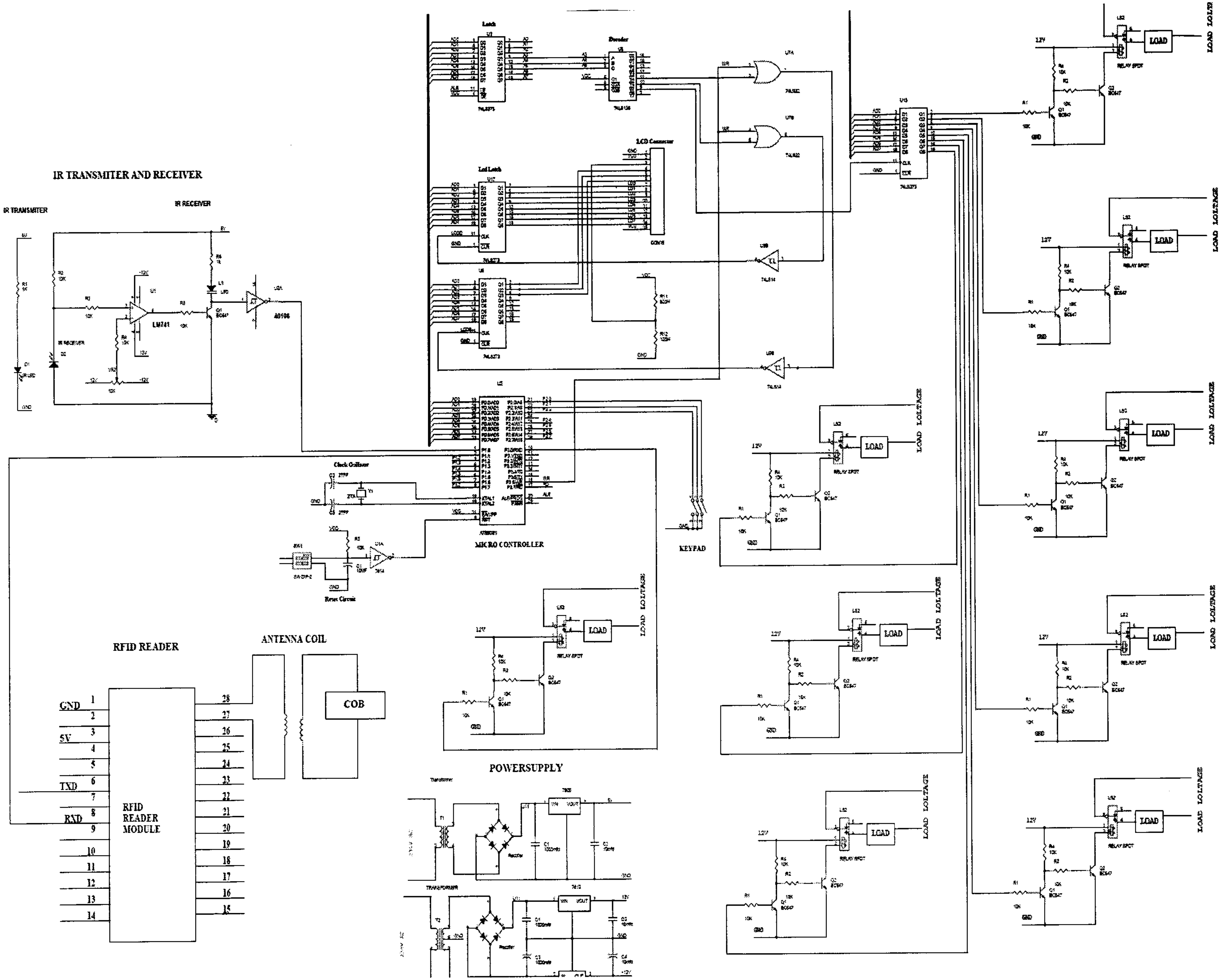
The program starts by displaying the identification of the driver who used the car. The program then performs the operations of opening the door automatically, adjusting the position of the seat, mirror and the cooling of AC. The appropriate relays are latched to the port '0' through 74LS273. The relays control the operation of the forward and reverse movement of the dc motors and thus making the desired adjustments of the seat and mirror.

The proximity sensors control the stopping of the motors by deactivating the relay. The sensors feed the values of the position when it senses a metal reducing its oscillations of eddy current, to the microcontroller.

The automatic regulation of the fan is done by connecting to a fan regulator. Since the regulator consists of different resistances the output we get is of different voltage levels. The automation is done by connecting the resistances to 3 different relays which is switched according to the program requirement.

The PC interfacing is done with the RS232 serial communication port. The PC displays the driver identification and details when the RFID tag is used. Also when an unauthorized person tries to open the door a security alert message is displayed. This is done with the IR security system by the use of IR transmitter and receiver.

The overall project implements the automation of the changes in settings inside the car at the same time providing maximum security and a method to track and identify the drivers using the car.


IR TRANSMITER AND RECEIVER
IR TRANSMITER
IR RECEIVER
LM741
Latch
Decoder
Lcd Latch
LCD Connector
MICRO CONTROLLER
Clock Oscillator
Reset Circuit
KEYPAD
LOAD
LOAD VOLTAGE
RELAY SPDT
RFID READER
ANTENNA COIL
COB
RFID READER MODULE
GND
5V
TXD
RXD
POWERSUPPLY

CHAPTER 8

CONCLUSION

8. CONCLUSION

The project thus implements the automation of the car settings using an RFID tag which also helps in identifying and tracking the driver along with providing maximum security to the vehicle from any theft attempts.

8.1 APPLICATIONS

- Modern cars can automate the settings inside the car before the person settles down.
- Large institutions can make use of the driver identification and tracking to marshal its resources more efficiently.
- IR security provides good security for a vehicle.
- RFID identification can replace the punch card system of marking attendance.
- RFID identification can be used by banks to provide secure bank lockers.
- IR security system can be used as an intruder detector at home.

8.2 FUTURE SCOPE

- Pneumatics can be used in changing the position of the seats to get quicker response.
- Finger print sensors on door locks can provide better security for identification.
- Global tracking and identification can be implemented.
- Door locks can be provided with password protection.
- Notification of the theft attempt to the nearest police station through the Internet.

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REFERENCES:

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4. www.uCOS-II.com.
5. www.ieeeexplorer.org
6. www.freescale.com
7. www.datasheetcatalog.com

APPENDIX I

SOFTWARE CODING

```
#include <REGX52.H>
#include <i2c.h>
#include <lcd.h>

pdata unsigned char dac _at_ 0x30;

sbit m_s1 = P2^0;
sbit m_s2 = P2^1;
sbit s_s1 = P2^2;
sbit s_s2 = P2^3;
sbit s_s3 = P2^4;
sbit ir = P2^7;

sbit key1 = P1^0;
sbit key2 = P1^1;
sbit key3 = P1^2;
sbit key4 = P1^3;
sbit key5 = P1^4;
sbit rly1 = P1^5;
sbit rly2 = P1^6;

void ser_init(void);
void ser_out(unsigned char);
void card_check();
void door();
void mirror();
void sheet();
void aircon();
void process();
void change();

unsigned int temp1;
unsigned char vr,cnt[10],cur;
unsigned char m_sta,a_sta,s_sta,addr;

void main()
{
   lcd_init();
   lsb();
   dac=0xff;
   ser_init();
   read(0x80);
   lcd_dis("  STATIC RELAY   ",16);
   read(0xc0);
   lcd_dis(" POWER   SYSTEM ",16);

   read(0x80);
   lcd_dis(" Show your Card ",16);
   read(0xc0);
   lcd_dis("                ",16);

while(1)
{
```

```
if(vr>9)
{
card_check();
vr=0;
}
if(ir)  ser_out('6');

}  //while
}  //main


void ser_init()
{
   EA=1;ES=1;
   TI=0;
   SCON=0X50;
   TMOD=0X21;
   TH1=0Xfd;     //9600
   TR1=1;
}

void ser_out(unsigned char rr)
{
  SBUF=rr;
  delay(255);
  SCON=0x58;
  delay(8000);
}

void ser_int() interrupt 4
{
      if(RI)
      {
            cnt[vr]=SBUF;
            vr++;
            RI=0;
      }
}

void card_check()
{
if(cnt[8]=='E' && cnt[9]=='2')
{
   read(0x80);
   lcd_dis("Person 1        ",16);
   read(0xc0);
   lcd_dis("                ",16);
ser_out('1');
      delay(65000);delay(5000);
      m_sta=i2c_read(0); delay(500);
      s_sta=i2c_read(1); delay(500);
      a_sta=i2c_read(2); delay(500);
   read(0x80);
   lcd_dis("MS:-  SS:-  AS:-",16);
   read(0x83); write(m_sta+0x30);
   read(0x89); write(s_sta+0x30);
   read(0x8f); write(a_sta+0x30);
```

```
    read(0xc0);
    lcd_dis("For Chn shw Card",16);
    temp1=5000;
    vr=0;
    while(temp1--)
    {
    if(vr>9)
    {
    if(cnt[8]=='E' && cnt[9]=='2')
    {
    change();
       i2c_write(0,m_sta); delay(500);
       i2c_write(1,s_sta); delay(500);
       i2c_write(2,a_sta); delay(500);
       delay(65000);
       read(0x01);
    read(0x80);
    lcd_dis("MS:-  SS:-  AS:-",16);
    read(0x83); write(m_sta+0x30);
    read(0x89); write(s_sta+0x30);
    read(0x8f); write(a_sta+0x30);
    break;
    }
    }
    delay(100);
    }
       process();
       i2c_write(addr,1); delay(500);
       addr++; if(addr>50) addr=40;
       i2c_write(51,addr); delay(500);
}
else if(cnt[8]=='D' && cnt[9]=='0')
{
    read(0x80);
    lcd_dis("Person 2        ",16);
    read(0xc0);
    lcd_dis("                ",16);
ser_out('2');
       delay(65000);delay(5000);
       m_sta=i2c_read(10); delay(500);
       s_sta=i2c_read(11); delay(500);
       a_sta=i2c_read(12); delay(500);
    read(0x80);
    lcd_dis("MS:-  SS:-  AS:-",16);
    read(0x83); write(m_sta+0x30);
    read(0x89); write(s_sta+0x30);
    read(0x8f); write(a_sta+0x30);
    read(0xc0);
    lcd_dis("For Chn shw Card",16);
    temp1=5000;
    vr=0;
    while(temp1--)
    {
    if(vr>9)
    {
    if(cnt[8]=='D' && cnt[9]=='0')
    {
```

```
change();
   i2c_write(10,m_sta); delay(500);
   i2c_write(11,s_sta); delay(500);
   i2c_write(12,a_sta); delay(500);
   delay(65000);
   read(0x01);
read(0x80);
lcd_dis("MS:-  SS:-  AS:-",16);
read(0x83); write(m_sta+0x30);
read(0x89); write(s_sta+0x30);
read(0x8f); write(a_sta+0x30);
break;
}
}
delay(100);
}
   process();
   i2c_write(addr,2); delay(500);
   addr++; if(addr>50) addr=40;
   i2c_write(51,addr); delay(500);
}
else if(cnt[8]=='6' && cnt[9]=='B')
{
   read(0x80);
   lcd_dis("Person 3        ",16);
   read(0xc0);
   lcd_dis("                ",16);
ser_out('3');
      delay(65000);delay(5000);
      m_sta=i2c_read(20); delay(500);
      s_sta=i2c_read(21); delay(500);
      a_sta=i2c_read(22); delay(500);
   read(0x80);
   lcd_dis("MS:-  SS:-  AS:-",16);
   read(0x83); write(m_sta+0x30);
   read(0x89); write(s_sta+0x30);
   read(0x8f); write(a_sta+0x30);
   read(0xc0);
   lcd_dis("For Chn shw Card",16);
   temp1=5000;
   vr=0;
   while(temp1--)
   {
   if(vr>9)
   {
   if(cnt[8]=='6' && cnt[9]=='B')
   {
   change();
      i2c_write(20,m_sta); delay(500);
      i2c_write(21,s_sta); delay(500);
      i2c_write(22,a_sta); delay(500);
      delay(65000);
      read(0x01);
   read(0x80);
   lcd_dis("MS:-  SS:-  AS:-",16);
   read(0x83); write(m_sta+0x30);
   read(0x89); write(s_sta+0x30);
```

```
   read(0x8f); write(a_sta+0x30);
   break;
   }
   }
   delay(100);
   }
      process();
      i2c_write(addr,3); delay(500);
      addr++; if(addr>50) addr=40;
      i2c_write(51,addr); delay(500);
}
else
{
   read(0x80);
   lcd_dis(" Unknown  Card. ",16);
   read(0xc0);
   lcd_dis("                ",16);
ser_out('6');
}
   read(0x80);
   lcd_dis(" Show your Card.",16);
   read(0xc0);
   lcd_dis("                ",16);
}
void door()
{
      dac=0xff;
   read(0xc0);
   lcd_dis("Door Opening    ",16);
      dac=0xfe;
      delay(65000);delay(65000);
      delay(65000);delay(65000);
      dac=0xff;
      delay(65000);delay(65000);
      delay(65000);delay(65000);
   read(0xc0);
   lcd_dis("Door Closing    ",16);
      dac=0xfd;
      delay(65000);delay(65000);
      delay(65000);delay(65000);
      dac=0xff;
   read(0xc0);
   lcd_dis("                ",16);
   delay(65000);
}
void mirror()
{
   read(0xc0);
   lcd_dis("Mirror Adjustm. ",16);
dac=0xef;
delay(65000);
delay(65000);
delay(65000);

if(m_sta==1)
{
dac=0xef;
```

```
while(m_s1);
dac=0xff;
}
else if(m_sta==2)
{
dac=0xdf;
while(m_s2);
dac=0xff;
}
else if(m_sta==3)
{
dac=0xdf;
while(m_s2 || m_s1);
dac=0xff;
}
delay(65000);
}
void sheet()
{
   read(0xc0);
   lcd_dis("Sheat Adjustment",16);
if(s_sta==1)
{
rly1=0;rly2=1;
while(s_s1);
rly1=1;
}
else if(s_sta==2)
{
if(!s_s3)
{
rly1=0;rly2=1;
while(s_s2);
rly1=1;
}
else if(!s_s1)
{
rly2=0;rly1=1;
while(s_s2);
rly2=1;
}
}
else if(s_sta==3)
{
rly2=0;rly1=1;
while(s_s3);
rly2=1;
}

delay(65000);
}
void aircon()
{
   read(0xc0);
   lcd_dis("Cooler Adjustm. ",16);
if(a_sta==1) dac=0xbf;
else if(a_sta==2) dac=0x7f;
```

```
else if(a_sta==3) dac=0xf7;
delay(65000);
}
void process()
{
      door();
      mirror();
      sheet();
      aircon();
      vr=0;
}
void change()
{
   read(0x80);
   lcd_dis("Set the values   ",16);
   read(0xc0);
   lcd_dis("MS:- SS:- AS:-   ",16);
   read(0xc3); write(m_sta+0x30);
   read(0xc8); write(s_sta+0x30);
   read(0xcd); write(a_sta+0x30);
cur=0;
while(key4)
{

if(!key1){cur++; if(cur>2)cur=0; delay(20000);}
if(cur==0)
{
if(!key2) m_sta++;
if(!key3) m_sta--;
if(m_sta>3) m_sta=1;
read(0x0f); read(0xc3); write(m_sta+0x30);
delay(20000);
}
if(cur==1)
{
if(!key2) s_sta++;
if(!key3) s_sta--;
if(s_sta>3) s_sta=1;
read(0x0f); read(0xc8); write(s_sta+0x30);
delay(20000);
}
if(cur==2)
{
if(!key2) a_sta++;
if(!key3) a_sta--;
if(a_sta>3) a_sta=1;
read(0x0fc); read(0xcd); write(a_sta+0x30);
delay(20000);
}

}
    read(0x80);
    lcd_dis("Values Updating ",16);

}
```

APPENDIX II

Features

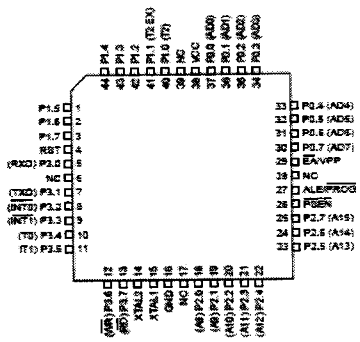
- Compatible with MCS-51™ Products
- 8K Bytes of In-System Reprogrammable Flash Memory
- Endurance: 1,000 Write/Erase Cycles
- Fully Static Operation: 0 Hz to 24 MHz
- Three-level Program Memory Lock
- 256 x 8-bit Internal RAM
- 32 Programmable I/O Lines
- Three 16-bit Timer/Counters
- Eight Interrupt Sources
- Programmable Serial Channel
- Low-power Idle and Power-down Modes

Description

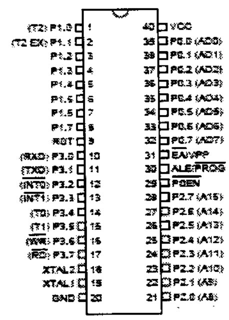
The AT89C52 is a low-power, high-performance CMOS 8-bit microcomputer with 8K bytes of Flash programmable and erasable read only memory (PEROM). The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the industry-standard 80C51 and 80C52 instruction set and pinout. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer. By combining a versatile 8-bit CPU with Flash on a monolithic chip, the Atmel AT89C52 is a powerful microcomputer which provides a highly-flexible and cost-effective solution to many embedded control applications.

Pin Configurations

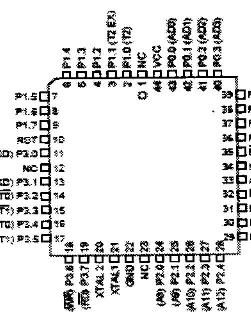
PQFP/TQFP



PDIP



PLCC



8-bit Microcontroller with 8K Bytes Flash

AT89C52

Not Recommended for New Designs. Use AT89S52.

Rev. 0313H–02/00

The AT89C52 provides the following standard features: 8K bytes of Flash, 256 bytes of RAM, 32 I/O lines, three 16-bit timer/counters, a six-vector two-level interrupt architecture, a full-duplex serial port, on-chip oscillator, and clock circuitry. In addition, the AT89C52 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port, and interrupt system to continue functioning. The Power-down mode saves the RAM contents but freezes the oscillator, disabling all other chip functions until the next hardware reset.

Pin Description

VCC

Supply voltage.

GND

Ground.

Port 0

Port 0 is an 8-bit open drain bi-directional I/O port. As an output port, each pin can sink eight TTL inputs. When 1s are written to port 0 pins, the pins can be used as high-impedance inputs.

Port 0 can also be configured to be the multiplexed low-order address/data bus during accesses to external program and data memory. In this mode, P0 has internal pullups.

Port 0 also receives the code bytes during Flash programming and outputs the code bytes during program verification. External pullups are required during program verification.

Port 1

Port 1 is an 8-bit bi-directional I/O port with internal pullups. The Port 1 output buffers can sink/source four TTL inputs. When 1s are written to Port 1 pins, they are pulled high by the internal pullups and can be used as inputs. As inputs, Port 1 pins that are externally being pulled low will source current (I_{IL}) because of the internal pullups.

In addition, P1.0 and P1.1 can be configured to be the timer/counter 2 external count input (P1.0/T2) and the timer/counter 2 trigger input (P1.1/T2EX), respectively, as shown in the following table.

Port 1 also receives the low-order address bytes during Flash programming and verification.

Port Pin	Alternate Functions
P1.0	T2 (external count input to Timer/Counter 2), clock-out
P1.1	T2EX (Timer/Counter 2 capture/reload trigger and direction control)

Port 2

Port 2 is an 8-bit bi-directional I/O port with internal pullups. The Port 2 output buffers can sink/source four TTL inputs. When 1s are written to Port 2 pins, they are pulled high by the internal pullups and can be used as inputs. As inputs, Port 2 pins that are externally being pulled low will source current (I_{IL}) because of the internal pullups.

Port 2 emits the high-order address byte during fetches from external program memory and during accesses to external data memory that use 16-bit addresses (MOVX @ DPTR). In this application, Port 2 uses strong internal pullups when emitting 1s. During accesses to external data memory that use 8-bit addresses (MOVX @ RI), Port 2 emits the contents of the P2 Special Function Register.

Port 2 also receives the high-order address bits and some control signals during Flash programming and verification.

Port 3

Port 3 is an 8-bit bi-directional I/O port with internal pullups. The Port 3 output buffers can sink/source four TTL inputs. When 1s are written to Port 3 pins, they are pulled high by the internal pullups and can be used as inputs. As inputs, Port 3 pins that are externally being pulled low will source current (I_{IL}) because of the pullups.

Port 3 also serves the functions of various special features of the AT89C51, as shown in the following table.

Port 3 also receives some control signals for Flash programming and verification.

Port Pin	Alternate Functions
P3.0	RXD (serial input port)
P3.1	TXD (serial output port)
P3.2	$\overline{\text{INT0}}$ (external interrupt 0)
P3.3	$\overline{\text{INT1}}$ (external interrupt 1)
P3.4	T0 (timer 0 external input)
P3.5	T1 (timer 1 external input)
P3.6	$\overline{\text{WR}}$ (external data memory write strobe)
P3.7	$\overline{\text{RD}}$ (external data memory read strobe)

RST

Reset input. A high on this pin for two machine cycles while the oscillator is running resets the device.

ALE/$\overline{\text{PROG}}$

Address Latch Enable is an output pulse for latching the low byte of the address during accesses to external memory. This pin is also the program pulse input ($\overline{\text{PROG}}$) during Flash programming.

In normal operation, ALE is emitted at a constant rate of 1/6 the oscillator frequency and may be used for external timing or clocking purposes. Note, however, that one ALE pulse is skipped during each access to external data memory.

If desired, ALE operation can be disabled by setting bit 0 of SFR location 8EH. With the bit set, ALE is active only during a MOVX or MOVC instruction. Otherwise, the pin is weakly pulled high. Setting the ALE-disable bit has no effect if the microcontroller is in external execution mode.

$\overline{PSEN}$

Program Store Enable is the read strobe to external program memory.

When the AT89C52 is executing code from external program memory, $\overline{PSEN}$ is activated twice each machine cycle, except that two $\overline{PSEN}$ activations are skipped during each access to external data memory.

$\overline{EA}$/VPP

External Access Enable. $\overline{EA}$ must be strapped to GND in order to enable the device to fetch code from external program memory locations starting at 0000H up to FFFFH. Note, however, that if lock bit 1 is programmed, $\overline{EA}$ will be internally latched on reset.

$\overline{EA}$ should be strapped to V_{CC} for internal program executions.

This pin also receives the 12-volt programming enable voltage (V_{PP}) during Flash programming when 12-volt programming is selected.

XTAL1

Input to the inverting oscillator amplifier and input to the internal clock operating circuit.

XTAL2

Output from the inverting oscillator amplifier.

Table 1. AT89C52 SFR Map and Reset Values

0F8H									0FFH
0F0H	B 00000000								0F7H
0E8H									0EFH
0E0H	ACC 00000000								0E7H
0D8H									0DFH
0D0H	PSW 00000000								0D7H
0C8H	T2CON 00000000	T2MOD XXXXXX00	RCAP2L 00000000	RCAP2H 00000000	TL2 00000000	TH2 00000000			0CFH
0C0H									0C7H
0B8H	IP XX000000								0BFH
0B0H	P3 11111111								0B7H
0A8H	IE 0X000000								0AFH
0A0H	P2 11111111								0A7H
98H	SCON 00000000	SBUF XXXXXXXX							9FH
90H	P1 11111111								97H
88H	TCON 00000000	TMOD 00000000	TL0 00000000	TL1 00000000	TH0 00000000	TH1 00000000			8FH
80H	P0 11111111	SP 00000111	DPL 00000000	DPH 00000000				PCON 0XXX0000	87H

Special Function Registers

A map of the on-chip memory area called the Special Function Register (SFR) space is shown in Table 1.

Note that not all of the addresses are occupied, and unoccupied addresses may not be implemented on the chip. Read accesses to these addresses will in general return random data, and write accesses will have an indeterminate effect.

User software should not write 1s to these unlisted locations, since they may be used in future products to invoke new features. In that case, the reset or inactive values of the new bits will always be 0.

Timer 2 Registers Control and status bits are contained in registers T2CON (shown in Table 2) and T2MOD (shown in Table 4) for Timer 2. The register pair (RCAP2H, RCAP2L) are the Capture/Reload registers for Timer 2 in 16-bit capture mode or 16-bit auto-reload mode.

Interrupt Registers The individual interrupt enable bits are in the IE register. Two priorities can be set for each of the six interrupt sources in the IP register.r

Table 2. T2CON – Timer/Counter 2 Control Registe

T2CON Address = 0C8H   Reset Value = 0000 0000B

Bit Addressable

Bit	TF2	EXF2	RCLK	TCLK	EXEN2	TR2	C/$\overline{T2}$	CP/$\overline{RL2}$
	7	6	5	4	3	2	1	0

Symbol	Function
TF2	Timer 2 overflow flag set by a Timer 2 overflow and must be cleared by software. TF2 will not be set when either RCLK = 1 or TCLK = 1.
EXF2	Timer 2 external flag set when either a capture or reload is caused by a negative transition on T2EX and EXEN2 = 1. When Timer 2 interrupt is enabled, EXF2 = 1 will cause the CPU to vector to the Timer 2 interrupt routine. EXF2 must be cleared by software. EXF2 does not cause an interrupt in up/down counter mode (DCEN = 1).
RCLK	Receive clock enable. When set, causes the serial port to use Timer 2 overflow pulses for its receive clock in serial port Modes 1 and 3. RCLK = 0 causes Timer 1 overflow to be used for the receive clock.
TCLK	Transmit clock enable. When set, causes the serial port to use Timer 2 overflow pulses for its transmit clock in serial port Modes 1 and 3. TCLK = 0 causes Timer 1 overflows to be used for the transmit clock.
EXEN2	Timer 2 external enable. When set, allows a capture or reload to occur as a result of a negative transition on T2EX if Timer 2 is not being used to clock the serial port. EXEN2 = 0 causes Timer 2 to ignore events at T2EX.
TR2	Start/Stop control for Timer 2. TR2 = 1 starts the timer.
C/$\overline{T2}$	Timer or counter select for Timer 2. C/$\overline{T2}$ = 0 for timer function. C/$\overline{T2}$ = 1 for external event counter (falling edge triggered).
CP/$\overline{RL2}$	Capture/Reload select. CP/$\overline{RL2}$ = 1 causes captures to occur on negative transitions at T2EX if EXEN2 = 1. CP/$\overline{RL2}$ = 0 causes automatic reloads to occur when Timer 2 overflows or negative transitions occur at T2EX when EXEN2 = 1. When either RCLK or TCLK = 1, this bit is ignored and the timer is forced to auto-reload on Timer 2 overflow.

Data Memory

The AT89C52 implements 256 bytes of on-chip RAM. The upper 128 bytes occupy a parallel address space to the Special Function Registers. That means the upper 128 bytes have the same addresses as the SFR space but are physically separate from SFR space.

When an instruction accesses an internal location above address 7FH, the address mode used in the instruction specifies whether the CPU accesses the upper 128 bytes of RAM or the SFR space. Instructions that use direct addressing access SFR space.

For example, the following direct addressing instruction accesses the SFR at location 0A0H (which is P2).

```
MOV 0A0H, #data
```

Instructions that use indirect addressing access the upper 128 bytes of RAM. For example, the following indirect addressing instruction, where R0 contains 0A0H, accesses the data byte at address 0A0H, rather than P2 (whose address is 0A0H).

```
MOV @R0, #data
```

Note that stack operations are examples of indirect addressing, so the upper 128 bytes of data RAM are available as stack space.

Timer 0 and 1

Timer 0 and Timer 1 in the AT89C52 operate the same way as Timer 0 and Timer 1 in the AT89C51.

Timer 2

Timer 2 is a 16-bit Timer/Counter that can operate as either a timer or an event counter. The type of operation is selected by bit C/$\overline{T2}$ in the SFR T2CON (shown in Table 2). Timer 2 has three operating modes: capture, auto-reload (up or down counting), and baud rate generator. The modes are selected by bits in T2CON, as shown in Table 3.

Timer 2 consists of two 8-bit registers, TH2 and TL2. In the Timer function, the TL2 register is incremented every machine cycle. Since a machine cycle consists of 12 oscillator periods, the count rate is 1/12 of the oscillator frequency.

Table 3. Timer 2 Operating Modes

RCLK +TCLK	CP/$\overline{RL2}$	TR2	MODE
0	0	1	16-bit Auto-reload
0	1	1	16-bit Capture
1	X	1	Baud Rate Generator
X	X	0	(Off)

In the Counter function, the register is incremented in response to a 1-to-0 transition at its corresponding external input pin, T2. In this function, the external input is sampled during S5P2 of every machine cycle. When the samples show a high in one cycle and a low in the next cycle, the count is incremented. The new count value appears in the register during S3P1 of the cycle following the one in which the transition was detected. Since two machine cycles (24 oscillator periods) are required to recognize a 1-to-0 transition, the maximum count rate is 1/24 of the oscillator frequency. To ensure that a given level is sampled at least once before it changes, the level should be held for at least one full machine cycle.

Capture Mode

In the capture mode, two options are selected by bit EXEN2 in T2CON. If EXEN2 = 0, Timer 2 is a 16-bit timer or counter which upon overflow sets bit TF2 in T2CON. This bit can then be used to generate an interrupt. If EXEN2 = 1, Timer 2 performs the same operation, but a 1-to-0 transition at external input T2EX also causes the current value in TH2 and TL2 to be captured into RCAP2H and RCAP2L, respectively. In addition, the transition at T2EX causes bit EXF2 in T2CON to be set. The EXF2 bit, like TF2, can generate an interrupt. The capture mode is illustrated in Figure 1.

Auto-reload (Up or Down Counter)

Timer 2 can be programmed to count up or down when configured in its 16-bit auto-reload mode. This feature is invoked by the DCEN (Down Counter Enable) bit located in the SFR T2MOD (see Table 4). Upon reset, the DCEN bit is set to 0 so that timer 2 will default to count up. When DCEN is set, Timer 2 can count up or down, depending on the value of the T2EX pin.

Figure 1. Timer in Capture Mode

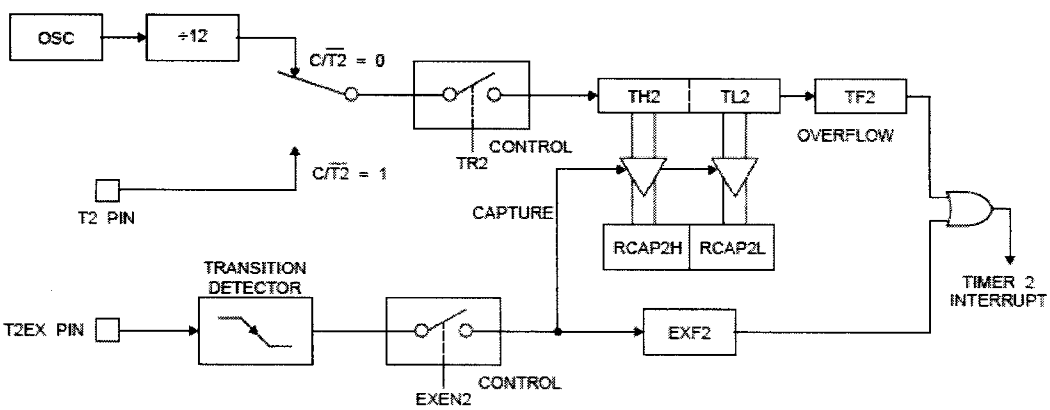


Figure 2 shows Timer 2 automatically counting up when DCEN = 0. In this mode, two options are selected by bit EXEN2 in T2CON. If EXEN2 = 0, Timer 2 counts up to 0FFFFH and then sets the TF2 bit upon overflow. The overflow also causes the timer registers to be reloaded with the 16-bit value in RCAP2H and RCAP2L. The values in Timer in Capture ModeRCAP2H and RCAP2L are preset by software. If EXEN2 = 1, a 16-bit reload can be triggered either by an overflow or by a 1-to-0 transition at external input T2EX. This transition also sets the EXF2 bit. Both the TF2 and EXF2 bits can generate an interrupt if enabled.

Setting the DCEN bit enables Timer 2 to count up or down, as shown in Figure 3. In this mode, the T2EX pin controls the direction of the count. A logic 1 at T2EX makes Timer 2 count up. The timer will overflow at 0FFFFH and set the TF2 bit. This overflow also causes the 16-bit value in RCAP2H and RCAP2L to be reloaded into the timer registers, TH2 and TL2, respectively.

A logic 0 at T2EX makes Timer 2 count down. The timer underflows when TH2 and TL2 equal the values stored in RCAP2H and RCAP2L. The underflow sets the TF2 bit and causes 0FFFFH to be reloaded into the timer registers.

The EXF2 bit toggles whenever Timer 2 overflows or underflows and can be used as a 17th bit of resolution. In this operating mode, EXF2 does not flag an interrupt.

Figure 2. Timer 2 Auto Reload Mode (DCEN = 0)

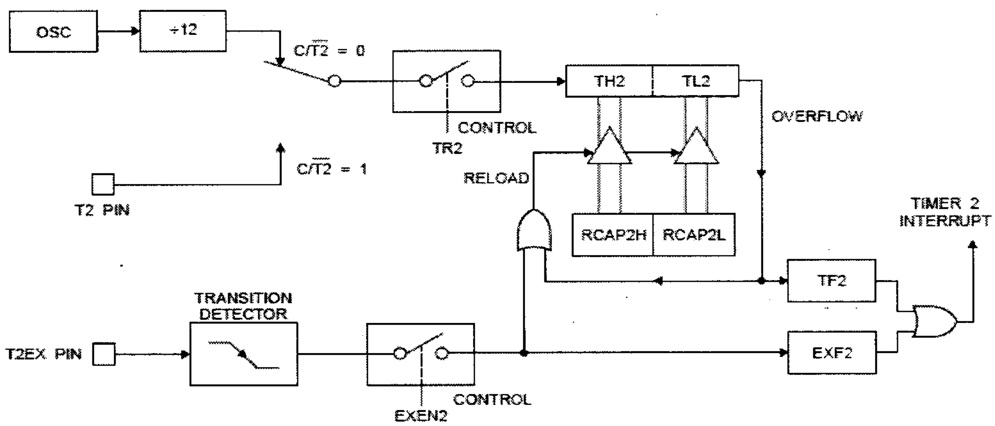


Table 4. T2MOD – Timer 2 Mode Control Register

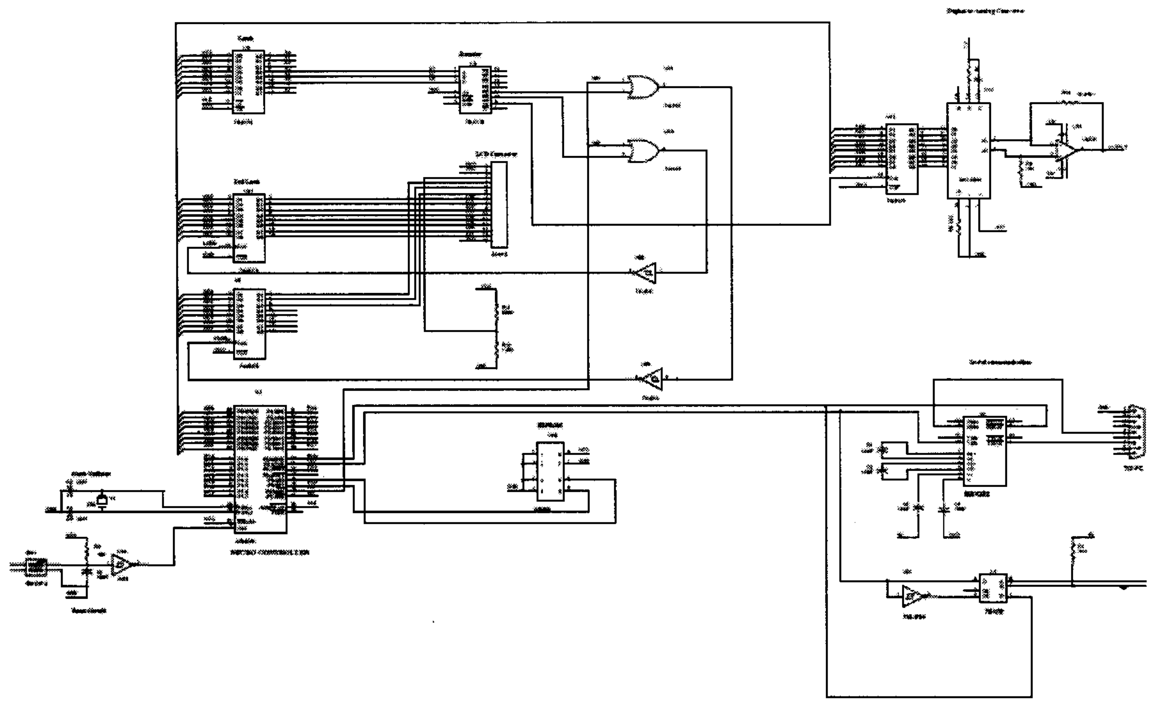
T2MOD Address = 0C9H Reset Value = XXXX XX00B

Not Bit Addressable

	–	–	–	–	–	–	T2OE	DCEN
Bit	7	6	5	4	3	2	1	0

Symbol	Function
–	Not implemented, reserved for future
T2OE	Timer 2 Output Enable bit.
DCEN	When set, this bit allows Timer 2 to be configured as an up/down counter.

MICRO CONTROLLER CIRCUIT



National Semiconductor

May 1992

DM54LS373/DM74LS373, DM54LS374/DM74LS374 TRI-STATE® Octal D-Type Transparent Latches and Edge-Triggered Flip-Flops

General Description

These 8-bit registers feature totem-pole TRI-STATE outputs designed specifically for driving highly-capacitive or relatively low-impedance loads. The high-impedance state and increased high-logic level drive provide these registers with the capability of being connected directly to and driving the bus lines in a bus-organized system without need for interface or pull-up components. They are particularly attractive for implementing buffer registers, I/O ports, bidirectional bus drivers, and working registers. (Continued)

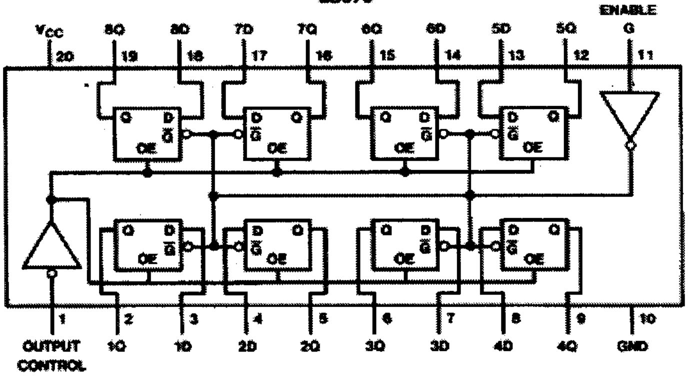
Features

- Choice of 8 latches or 8 D-type flip-flops in a single package
- TRI-STATE bus-driving outputs
- Full parallel-access for loading
- Buffered control inputs
- P-N-P inputs reduce D-C loading on data lines

Connection Diagrams

Dual-In-Line Packages

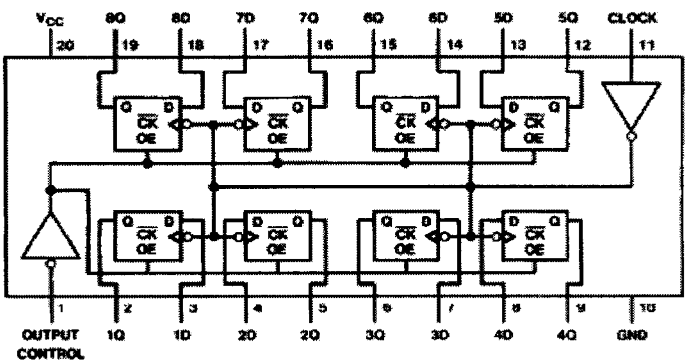
'LS373



TL/F/6431-1

Order Number DM54LS373J, DM54LS373W, DM74LS373N or DM74LS373WM
See NS Package Number J20A, M20B, N20A or W20A

'LS374



TL/F/6431-2

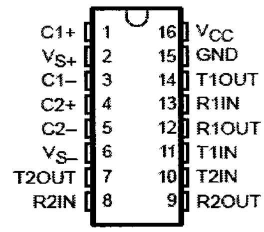
Order Number DM54LS374J, DM54LS374W, DM74LS374WM or DM74LS374N
See NS Package Number J20A, M20B, N20A or W20A

TRI-STATE® is a registered trademark of National Semiconductor Corp.

RRD-B30M105/Printed in U. S. A.

- Meet or Exceed TIA/EIA-232-F and ITU Recommendation V.28
- Operate With Single 5-V Power Supply
- Operate Up to 120 kbit/s
- Two Drivers and Two Receivers
- ±30-V Input Levels
- Low Supply Current . . . 8 mA Typical
- Designed to be Interchangeable With Maxim MAX232
- ESD Protection Exceeds JESD 22
  – 2000-V Human-Body Model (A114-A)
- Applications
  - TIA/EIA-232-F
  - Battery-Powered Systems
  - Terminals
  - Modems
  - Computers

MAX232 . . . D, DW, N, OR NS PACKAGE
MAX232I . . . D, DW, OR N PACKAGE
(TOP VIEW)



description/ordering information

The MAX232 is a dual driver/receiver that includes a capacitive voltage generator to supply EIA-232 voltage levels from a single 5-V supply. Each receiver converts EIA-232 inputs to 5-V TTL/CMOS levels. These receivers have a typical threshold of 1.3 V and a typical hysteresis of 0.5 V, and can accept ±30-V inputs. Each driver converts TTL/CMOS input levels into EIA-232 levels. The driver, receiver, and voltage-generator functions are available as cells in the Texas Instruments LinASIC™ library.

ORDERING INFORMATION

T_A	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
0°C to 70°C	PDIP (N)	Tube	MAX232N	MAX232N
	SOIC (D)	Tube	MAX232D	MAX232
		Tape and reel	MAX232DR	
	SOIC (DW)	Tube	MAX232DW	MAX232
		Tape and reel	MAX232DWR	
	SOP (NS)	Tape and reel	MAX232NSR	MAX232
–40°C to 85°C	PDIP (N)	Tube	MAX232IN	MAX232IN
	SOIC (D)	Tube	MAX232ID	MAX232I
		Tape and reel	MAX232IDR	
	SOIC (DW)	Tube	MAX232IDW	MAX232I
		Tape and reel	MAX232IDWR	

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.

Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

LinASIC is a trademark of Texas Instruments.

TEXAS INSTRUMENTS

3.0 microID FSK READER

The electronic circuitry for an FSK reader is shown in Figure 3-1. The reader needs +9 VDC power supply. The 125 kHz carrier signal is generated by dividing the 4 MHz time base signal that is generated by a crystal oscillator. A 16-stage binary ripple counter (74HC4060) is used for this purpose. The 74HC4060 also provides a clock signal for the PIC16C84 microcontroller. The 125 kHz signal is passed to an RF choke (L1) and filter before it is fed into a power amplifier that is formed by a pair of complementary bipolar transistors (Q2 and Q3).

For long read-range applications, this power amplifier circuit can be modified. Power MOSFETs may be used instead of the bipolar transistors (2N2222). These power MOSFETs can be driven by +24 VDC power supply. A push-pull predriver can be added at the front of the complementary circuit. This modification will enhance the signal level of the carrier signal.

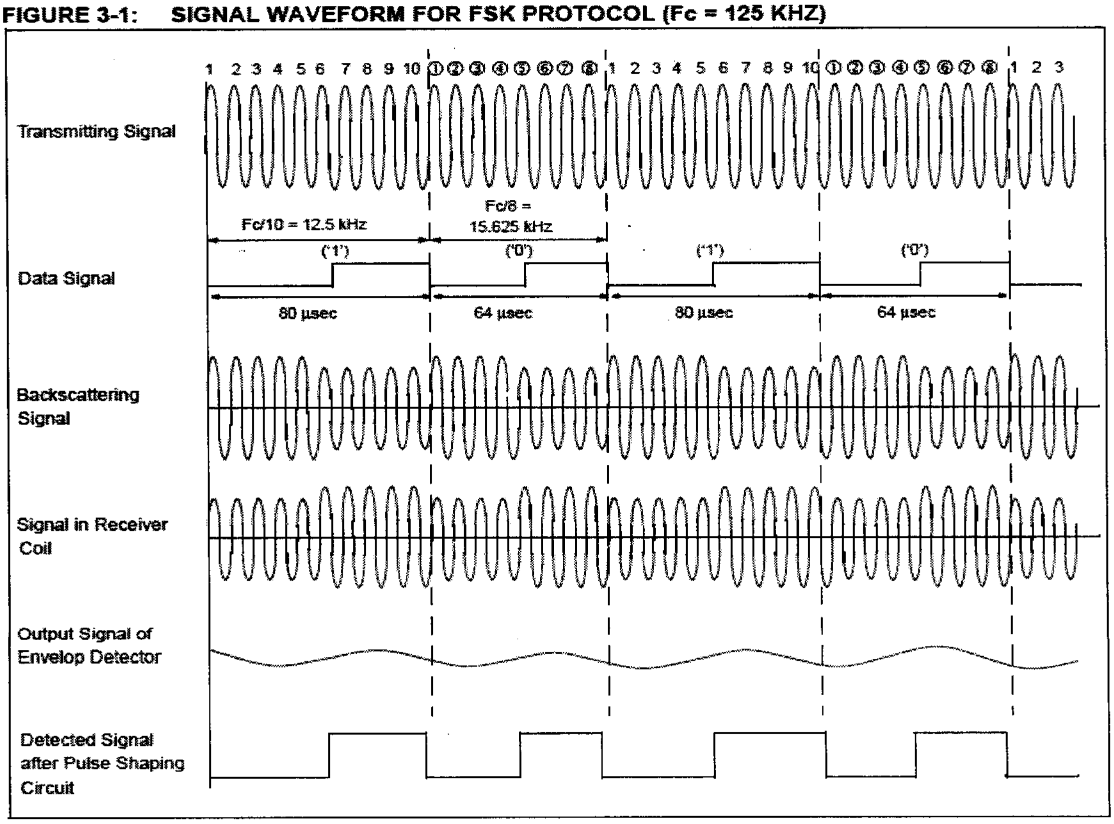
The reader circuit uses a single coil for both transmitting and receiving signals. An antenna coil (L2: 1.62 mH) and a resonant capacitor (C2: 1000 pF) forms a series resonant circuit for a 125 kHz resonance frequency. Since the C2 is grounded, the carrier signal (125 kHz) is filtered out to ground after passing the antenna coil. The circuit provides a minimum impedance at the resonance frequency. This results in maximizing the antenna current, and therefore, the magnetic field strength is maximized.

L2, C15, D7, and the other bottom parts in the circuit form a signal receiving section. The voltage drop in the antenna coil is a summation (superposition) of transmitting signal and backscattering signal. The D7 is a demodulator which detects the envelope of the backscattering signal. The FSK signal waveforms are shown in Figure 3-1.

D7 and C19 form a half-wave capacitor-filtered rectifier circuit. The detected envelope signal is charged into the C19. R21 provides a discharge path for the voltage charged in the C19. This voltage passes active filters (U8) and the pulse shaping circuitry (U8) before it is fed into the PIC16C84 for data processing.

The PIC16C84 microcontroller performs data decoding and communicates with the host computer via an RS-232 serial interface.

FIGURE 3-1: SIGNAL WAVEFORM FOR FSK PROTOCOL (Fc = 125 KHZ)



4.0 FSK READER SCHEMATIC