Design And Implementation Of RFID Based Highway Toll Collection System Using Arduino



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DECLARATION OF AUTHENTICATION

This is to certify that the project titled “Design and Implementation of RFID based highway toll collection system using Arduino” is the result of our study in partial fulfillment of the B.Sc. Engineering degree under the supervision of Rais Uddin Mollah, Head of the department, Department of Electrical and Electronic Engineering (EEE), Sonargaon University, Bangladesh. It is also hereby declared that this project or any part of it has not been submitted elsewhere for the award of any degree.

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This is to clarify that the following students worked on this research and project designated" Design and Implementation of RFID based highway toll collection system using Arduino" under my direct supervision in the laboratories of the Department of Electrical and Electronic Engineering, Faculty of Engineering, Sonargaon University, in partial fulfillment of the requirements for the degree of Bachelor of Science in Electrical and Electronic Engineering.

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ABSTRACT

ATCS is an Automated Toll Collection System used for collecting automatically. In this project we do the identification with the help of radio frequency. A vehicle will hold an RFID tag. This tag is nothing but unique identification number assigned. This will be assigned by RTO or traffic governing authority. In accordance with this number we will store, all basic information as well as the amount he has paid in advance for the TOLL collection. Reader will be strategically placed at toll collection center. Whenever the vehicle passes the toll collection center, the tax amount will be deducted from his prepaid balance. New balance will be updated. In case if one has insufficient balance, his updated balance will be negative one. To tackle this problem, we are alarming a sound, which will alert the authority that this vehicle doesn't have sufficient balance and that particular vehicle can be trapped. As vehicles don't have to stop in a queue, it assures time saving, fuel conservation and also contributing in saving money. Automatic Toll Collection systems have really helped a lot in reducing the heavy congestion caused in the metropolitan cities of today. It is one of the easy methods used to organize the heavy flow of traffic.

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LIST OF ABBREVIATIONS

A	Ampere
AC	Alternative Current
AFH	Adaptive Frequency Hopping
C	Capacitance
CDI	Capacitor Discharge Ignition
CMOS	Complementary Metal Oxide Semiconductor
CT	Current Transformer
DC	Direct Current
EDR	Enhance Data Rate
EEPROM	Electrically Erasable Programmable Read-Only Memory
EN	Enable
F	Farad
FTDI	Future Technology Devices International
GHz	Giga Harz
GND	Ground
GSM	Global System for Mobile Communication
IC	Integrated Circuit
I/O	Input Output
IRLED	Infrared Light Emitting Diode
IoT	Internet of Thinks
K	Kilo
KB	Kilo Byte
LCD	Liquid Cristal Display
LDR	Light Dependent Resistor
LED	Light emitting Diode
mA	Mile Ampere
MAC	Media Access Control
Mbps	Mega Byte per Second
MCU	Microcontroller Unit
MHz	Mega Harz
MPU	Microprocessor Unit

N/O	Normally Open
N/C	Normally Close
PCB	Printed Circuit Board
PT	Potential Transformer
PWM	Pulse Wide Modulation
R	Resistance
RAM	Random Access Memory
RSR	Reset
RX	Receiver
RXD	Received Serial Data
R/W	Read Write
S/I	International System
SPDT	Single Pole Double Throw
SPP	Serial Port Protocol
TTL	Transistor-Transistor Logic
TX	Transmitter
TXD	Transmitted Serial Data
USB	Universal Serial Bus
V	Voltage
VCC	Voltage Common Collector
Vin	Input Voltage

LIST OF SYMBOLS

Ω	ohm
uF	Microfarad
nF	Nano farad
Ωt	Time Phase
°C	Degree Celsius
Q	Charge

Chapter I
Introduction

1.1 Introduction

The toll collection system using RFID is a fully digitalize system which has no need of any manual operations at the toll stations. To design and develop an Automatic toll collection, which is based upon microcontroller, RFID technology and sensors save the time at toll plaza and to have a cash free operation. As the name “Toll collection system using RFID” refers to the main key theme automation. Here we are going to see the human less plaza. In earlier system the highways take 1 minute to complete the toll collection process for one vehicle. With this automatic process, it will take just 40 to 42 sec to complete the whole process. There is reduction in time for completion of the process so indirectly there will be no traffic as such and as there is no traffic so no fuel wastage takes place and the purpose of optimal use of the highways is achieved i.e. reduction in journey time and cost.

1.2 RFID

RFID (radio frequency identification) is a form of wireless communication that incorporates the use of electromagnetic or electrostatic coupling in the radio frequency portion of the electromagnetic spectrum to uniquely identify an object, animal or person.

Every RFID system consists of three components: a scanning antenna, a transceiver and a transponder. When the scanning antenna and transceiver are combined, they are referred to as an RFID reader or interrogator. There are two types of RFID readers -- fixed readers and mobile readers. The RFID reader is a network-connected device that can be portable or permanently attached. It uses radio waves to transmit signals that activate the tag. Once activated, the tag sends a wave back to the antenna, where it is translated into data.

The transponder is in the RFID tag itself. The read range for RFID tags varies based on factors including the type of tag, type of reader, RFID frequency and interference in the surrounding environment or from other RFID tags and readers. Tags that have a stronger power source also have a longer read range.

1.3 Types of RFID

There are three main types of RFID systems: low frequency (LF), high frequency (HF) and ultra-high frequency (UHF). Microwave RFID is also available. Frequencies vary greatly by country and region.

1.3.1 Low-frequency RFID

These range from 30 KHz to 500 KHz, though the typical frequency is 125 KHz. LF RFID has short transmission ranges, generally anywhere from a few inches to less than six feet.

1.3.2 High-frequency RFID

These range from 3 MHz to 30 MHz, with the typical HF frequency being 13.56 MHz The standard range is anywhere from a few inches to several feet.

1.3.3 UHF RFID systems

These range from 300 MHz to 960 MHz, with the typical frequency of 433 MHz and can generally be read from 25-plus feet away.

1.3.4 Microwave RFID

These run at 2.45 GHz and can be read from 30-plus feet away.

The frequency used will depend on the RFID application, with actual obtained distances sometimes varying from what is expected. For example, when the U.S. State Department announced it would issue electronic passports enabled with an RFID chip, it said the chips would only be able to be read from approximately 4 inches away. However, the State Department soon received evidence that RFID readers could skim the information from the RFID tags from much farther than 4 inches -- sometimes upward of 33 feet away.

1.4 RFID security and privacy

A common RFID security or privacy concern is that RFID tag data can be read by anyone with a compatible reader. Tags can often be read after an item leaves a store or supply chain. They can also be read without a user's knowledge using unauthorized readers, and if a tag has a unique serial number, it can be associated to a consumer. While a privacy concern for individuals, in military or medical settings this can be a national security concern or life-or-death matter.

Because RFID tags do not have a lot of compute power, they are unable to accommodate encryption, such as might be used in a challenge-response authentication system. One exception to this, however, is specific to RFID tags used in passports -- basic access control (BAC). Here, the chip has sufficient compute power to decode an encrypted token from the reader, thus proving the validity of the reader.

At the reader, information printed on the passport is machine-scanned and used to derive a key for the passport. There are three pieces of information used -- the passport number, the passport holder's birth date and the passport's expiration date -- along with a checksum digit for each of the three.

Researchers say this means passports are protected by a password with considerably less entropy than is normally used in e-commerce. They key is also static for the life of the passport, so once an entity has had one-time access to the printed key information, the passport is readable with or without the consent of the passport bearer until the passport expires.

1.5 Problem Statement

Whenever the matter of Integration of systems comes to mind, we think of a system having the following important features viz. Accuracy: All the functionally bonded logical dependencies must be integrated. Efficiency: The whole system should work under all circumstances and on a long run it should work efficiently irrespective of their proprietary format. Cost Effectiveness: As our software do not require any special software for implementation hence is less costly as compared to other existing system. Any Prerequisite for the use: As the existing systems are not altered, and integration is done at the background hence there is no need for any training.

1.6 Proposed System

This project gives the simplified procedure to passengers to pay toll at toll booths by making them automated, vehicle theft detection, signal breaking avoidance, tracking over speed vehicles. All these activities are carried using single RFID tag thus saving the efforts of carrying money and records manually. A. Automatic Toll Collection: The RFID Readers mounted at toll booth will read the prepaid RFID tags fixed on vehicles' windshield and automatically respective amount will be deducted. If the tag is removed from the windshield then cameras fixed at two sites at toll plaza take snaps of the front

and back number plate. Since every vehicle registration ID is linked to users account, toll can be deducted from the account bank directly. B. Vehicle Theft Detection: When vehicle is stolen the owner registers complaint on the website with its registration ID and unique RFID tag number. Now when stolen vehicle passes by the toll plaza, the tag fixed on it is matched with the stolen vehicle's tag in the database at the toll booth. C. Signal Breaking Avoidance: The vehicle ignoring the traffic signal will be detected by the RFID readers fixed at signal crossing and will be notified to the traffic police. This can be done efficiently and great accuracy. D. Tracking Over speeding Vehicle: Vehicle travelling above speed limit can be tracked with 100 % accuracy.

1.7 Objectives

The main objective of the project is to develop an efficient module for automatic toll tax collection. The proposed objective is based on three modules

1. Sensor technology- it is used to detect vehicle arrived and the speed is also detected using proximity sensor. If the speed of the vehicle and if the speed exceeds then vehicle must pay the fine along with toll tax.

2. RFID technology- it mainly aims for identifying the card sensed on the toll plazas. RFID tag is scanned through RFID reader, by Radio frequency in the form of waves within a particular distance. The RFID tag is linked with owner account, each RFID tag has a wallet to which the owner has to top-up with prepaid amount.

3. IoT technology-To report the amount deducted, this research work utilizes the Node MCU to send message through Internet of Things (IoT) server, which has worldwide coverage. It is currently the most efficient communication technology. To report the Total amount with or without fine deducted to the authorities, IoT is the best possible solution.

1.8 Research Methodology

Whenever any person buys a vehicle, one first needs to get his or her vehicle registered at the RTO office. RTO officials will not only assign a number plate to it but also will give a RFID enabled smart card or a tag. This card will have a unique ID feasible to use with that vehicle only. They will also create an account for the use of that particular smart card and maintain transaction history in database. User needs to deposit some

minimum amount to this account. Every time a registered vehicle approaches the toll booth, first the Infrared sensors will detect the presence of the vehicle. It will in turn activate the RFID circuit to read the RFID enable smart card fixed on the windscreen of the vehicle. Transaction will begin, depending upon the balance available toll will be deducted directly or the vehicle will be directed towards another lane to pay tax manually. The software further updates the details in the Centralized database server. It also triggers mechanism to generate the bill and will be sent to user as a text message.

On the other hand, whenever any vehicle owner registers a complaint to RTO office regarding theft respective entry is made in the database. Now any vehicle arriving at toll booth with same ID as already present in stolen vehicle category will be easily identified as the ID assigned with it is unique. All the toll plazas will be connected to each other along with the centralized server in the form of LAN. Updates of any sort of transaction will be immediately updated to local database and centralized server.

1.9 Project Outline

This project is organized as follows:

Chapter 1 Introduction.

In this chapter we discus about this project.

Chapter 2 Analysis of the system component.

In this chapter we discus about all component, which component we used in this project. Like Arduino Nano, Proximity sensor, Servo Motor, RFID Module, resistor, capacitor, diode, Transistor, etc.

Chapter 3 Hardware development.

In this chapter we discus about hardware developing. how we develop our project, how we make this project.

Chapter 4 Result and discussions.

In this chapter we discus about project output, we check load status and previous cut off data.

Chapter 5 Conclusions.

Chapter II
Analysis of the System Component

2.1 Introduction

The proposed system is RFID based toll tax collection system. The system detects RFID tag and collect toll or tax according to BRTC rules and finally give access to pass toll plaza. The system will bear following functionalities:

- ✓ It will check type of vehicle.
- ✓ It will check speed of vehicle.
- ✓ It can collect toll automatically.
- ✓ This system can toll plaza from robbery.

2.2 Required Component

The Controller has the following main components.

Component	**Description**
Arduino Nano	ATmega328p PU
RFID Module.	RC522
Proximity Sensor	IR
Servo Motor	SG 90
Voltage regulator IC	LM7805
Display Module	16x2
Power Connector.	E.Connector
Diode.	1N4007
Resistor.	100-ohm, 1K, 10K
Capacitor.	220uf, 470uf, 10pf
Transistor.	BC547
Vero-Board.	Doted
Software	**Windows**
Arduino IDE	V2.18
Proteus	SP2 V8.2
Serial monitor	Tera-tarm

Table: 2.1 Required Component

2.3 Arduino Nano

The Arduino Nano is a MPU based developer board. It is a small, complete, and breadboard-friendly board based on the ATmega328P released in 2008. It offers the same connectivity and specs of the Arduino Uno board in a smaller form factor. The Arduino Nano is equipped with 30 male I/O headers, in a dip-30 like configuration, which can be programmed using the Arduino Software integrated development environment (IDE), which is common to all Arduino boards and running both online and offline. The board can be powered through a type-b micro-USB cable, or through a 9V battery.

In 2019, Arduino released the Arduino Nano Every, a pin-equivalent evolution of the Nano. It features a more powerful ATmega4809 processor, and twice the RAM.



Fig: 2.1 Arduino Nano.

The Arduino Nano has a number of facilities for communicating with a computer, another Arduino, or other microcontrollers. The ATmega328 provide UART TTL (5V) serial communication, which is available on digital pins 0 (RX) and 1 (TX). An FTDI FT232RL on the board channels this serial communication over USB and the FTDI drivers (included with the Arduino software) provide a virtual com port to software on the computer. The Arduino software includes a serial monitor which allows simple textual data to be sent to and from the Arduino board. The RX and TX LEDs on the board will flash when data is being transmitted via the FTDI chip and USB connection to the computer (but not for serial communication on pins 0 and 1). A Software Serial library allows for serial communication on any of the Nano's digital pins. The ATmega328 also support I2C (TWI) and SPI communication. The Arduino software includes a Wire library to simplify use of the I2C bus.

2.3.1 Specification of Arduino Nano

Arduino Nano	
Microcontroller	Microchip ATmega328p
Operating Voltage	5V
Input Voltage	6-20V
Digital I/O Pins (DIO)	14
Analog Input Pins (ADC)	8
DC Current per I/O	40mA
SPIs	1
I2Cs	1
Flash Memory	32 KB
SRAM	2 KB
EEPROM	1 KB
Clock Speed	16 MHz
USB	Mini type B
Reset Button	YES
Serial LED	2 pcs
Load LED	1 pcs (pin 13)

Table: 2.2 Specification of Arduino Nano

2.3.2 Pin Function of Arduino Nano

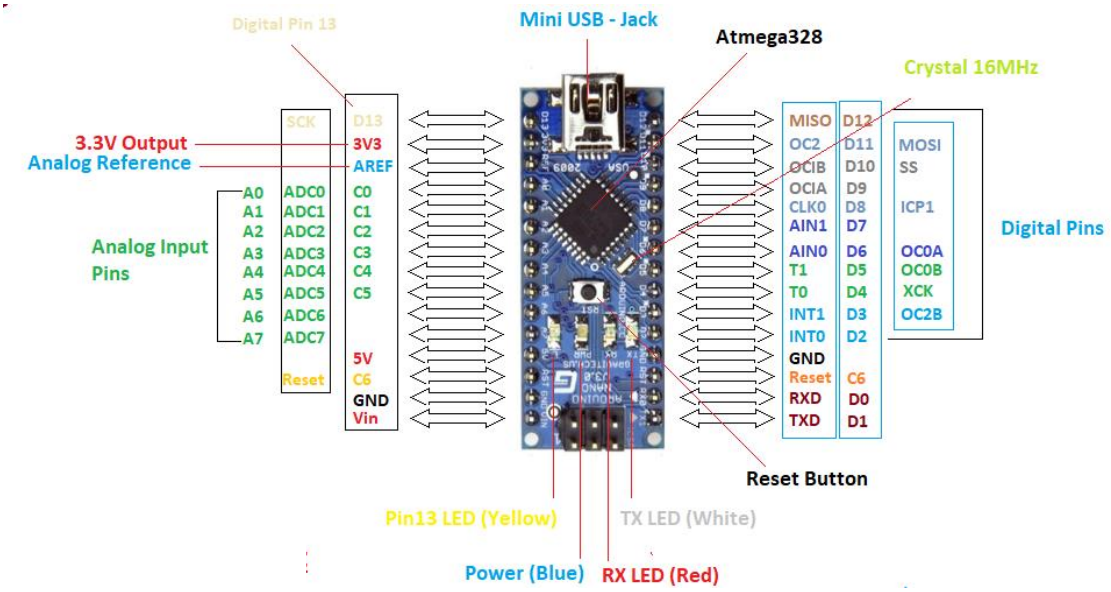


Fig: 2.2 Pin Function of Arduino Nano.

Level	Data Pin(D)	Notes
A0-A7		Analog to Digital Converter (ADC)
Reset		Reset Pin
D0-D13		Data Pin
RX	0	Serially Receiving Pin
TX	1	Serially Transmitting Pin
INT0	2	Interrupt Pin 1
INT1	3	Interrupt Pin 2
PWM	3, 5, 6,9,10,11	Pulse Wide Modulation Pin
SPI	10, 11, 12, 13	SS, MOS1, MOS0, SCK
GND		Ground
3V3		3.3V Output
LED	13	Inbuilt LED
RST		Reset
GND		Ground
Vin		Raw input Voltage
2IC	A4, A5	Serially data transmit

Table: 2.3 Pin function of Arduino Nano.

2.4 RFID Module

Radio-frequency identification uses electromagnetic fields to automatically identify and track tags attached to objects. An RFID system consists of a tiny radio transponder called a tag, a radio receiver, and a transmitter. When triggered by an electromagnetic interrogation pulse from a nearby RFID reader device, the tag transmits digital data, usually an identifying inventory number, back to the reader. This number can be used to track inventory goods.

Passive tags are powered by energy from the RFID reader's interrogating radio waves. Active tags are powered by a battery and thus can be read at a greater range from the RFID reader, up to hundreds of meters.

Unlike a barcode, the tag does not need to be within the line of sight of the reader, so it may be embedded in the tracked object. RFID is one method of automatic identification and data capture (AIDC).

RFID tags are used in many industries. For example, an RFID tag attached to an automobile during production can be used to track its progress through the assembly line,[citation needed] RFID-tagged pharmaceuticals can be tracked through warehouses,[citation needed] and implanting RFID microchips in livestock and pets enables positive identification of animals.[3][4] Tags can also be used in shops to expedite checkout, and to prevent theft by customers and employees.

Since RFID tags can be attached to physical money, clothing, and possessions, or implanted in animals and people, the possibility of reading personally-linked information without consent has raised serious privacy concerns.[6] These concerns resulted in standard specifications development addressing privacy and security issues.



Fig: 2.3 RFID Module RC522

2.4.1 Pin Function of RC522 RFID Module

Number	Name	Description
1	VCC	Used to Power the module, typically 3.3V is used
2	RST	Reset pin – used to reset or power down the module
3	GND	Connected to Ground of system
4	IRQ	Interrupt pin – used to wake up the module when a device comes into range
5	MISO	Master IN Slave OUT for SPI communication
6	MOSI	Master out slave in pin for SPI communication
7	SCK	Serial Clock pin – used to provide clock source
8	SDA	Acts as Serial input (SS) for SPI communication, SDA for IIC and Rx during UART

Table: 2.4 Pin Function of RC522 RFID Module.

2.5 Proximity Sensor

Proximity Sensor are used to detect objects and obstacles in front of sensor. Sensor keeps transmitting infrared light and when any object comes near, it is detected by the sensor by monitoring the reflected light from the object. It can be used in robots for obstacle avoidance, for automatic doors, for parking aid devices or for security alarm systems, or contact less tachometer by measuring RPM of rotation objects like fan blades.

A proximity sensor is a sensor able to detect the presence of nearby objects without any physical contact. An IR proximity sensor emits a beam of Infrared radiation and looks for changes in the field or return signal. The object being sensed is often referred to as the proximity sensor's target.

The module works well for the distance 2 ~ 30cm and a detection angle 35 °, The sensitivity of this can be adjusted by varying the potentiometer, the sensor module output port OUT port can be directly connected to the microcontroller IO can also be used to directly drive a 5V relay;



Fig: 2.4 IR Proximity Sensor.

2.5.1 Feature of Proximity Sensor

- IR transmitter.
- Ambient light protected IR receiver.
- 3 pin easy interface connectors.
- Indicator LED & Power LED.
- Distance 2cm to 30cm.
- Can differentiate between dark and light colors.
- Active Low on object detection 3.3 to 5V operation.

2.6 Servo Motor

A servo motor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration. It consists of a suitable motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servo motors.

Servo motors are not a specific class of motor, although the term servo motor is often used to refer to a motor suitable for use in a closed-loop control system.

Servo motors are used in applications such as robotics, CNC machinery, and automated manufacturing.



Fig: 2.5 Servo Motor.

2.6.1 Mechanism of Servo Motor

A servo motor is a closed-loop servo mechanism that uses position feedback to control its motion and final position. The input to its control is a signal (either analogue or digital) representing the position commanded for the output shaft.

The motor is paired with some type of position encoder to provide position and speed feedback. In the simplest case, only the position is measured. The measured position of the output is compared to the command position, the external input to the controller. If the output position differs from that required, an error signal is generated which then causes the motor to rotate in either direction, as needed to bring the output shaft to the appropriate position. As the positions approach, the error signal reduces to zero and the motor stops.

The very simplest servo motors use position only sensing via a potentiometer and bang-bang control of their motor; the motor always rotates at full speed (or is stopped). This type of servomotor is not widely used in industrial motion control, but it forms the basis of the simple and cheap servos used for radio-controlled models.

More sophisticated servo motors use optical rotary encoders to measure the speed of the output shaft, and a variable speed drive to control the motor speed. Both of these enhancements, usually in combination with a PID control algorithm, allow the servomotor to be brought to its commanded position more quickly and more precisely, with less overshooting.

Servo motors are generally used as a high-performance alternative to the stepper motor. Stepper motors have some inherent ability to control position, as they have built-in output steps. This often allows them to be used as an open-loop position control, without any feedback encoder, as their drive signal specifies the number of steps of movement to rotate, but for this the controller needs to 'know' the position of the stepper motor on power up. Therefore, on first power up, the controller will have to activate the stepper motor and turn it to a known position, e.g. until it activates an end limit switch. This can be observed when switching on an inkjet printer; the controller will move the ink jet carrier to the extreme left and right to establish the end positions. A servomotor can immediately turn to whatever angle the controller instructs it to, regardless of the initial position at power up, if an absolute encoder is used.

The lack of feedback of a stepper motor limits its performance, as the stepper motor can only drive a load that is well within its capacity, otherwise missed steps under load may lead to positioning errors and the system may have to be restarted or recalibrated. The encoder and controller of a servomotor are an additional cost, but they optimize the performance of the overall system (for all of speed, power and accuracy) relative to the capacity of the basic motor. With larger systems, where a powerful motor represents an increasing proportion of the system cost, servomotors have the advantage.

There has been increasing popularity in closed loop stepper motors in recent years. They act like servomotors but have some differences in their software control to get smooth motion. The main benefit of a closed loop stepper motor is its relatively low cost. There is also no need to tune the PID controller on a closed loop stepper system

2.7 Voltage regulator IC

Voltage sources in a circuit may have vacillations bringing about not giving settled voltage yields. A voltage controller IC keeps up the yield voltage at a consistent esteem. 7805 IC, an individual from 78xx arrangement of settled straight voltage controllers used to keep up such changes, is a mainstream voltage controller IC. The xx in 78xx demonstrates the yield voltage it gives. 7805 IC furnishes +5 volts controlled power supply with arrangements to include a warmth sink.

2.7.1 Specification of 7805 Voltage Regulator IC

i. Input voltage range 7V to 35V.

ii. Output Current 1 A.

iii. Output voltage range V_{Max} = 5.2V, V_{Min} = 4.8V.

2.7.2 Pin Function of 7805 Voltage Regulator IC.

Pin NO	Pin Name
1	Input pin
2	Ground pin
3	Output pin

Table: 2.5 Pin Function of 7805 IC.

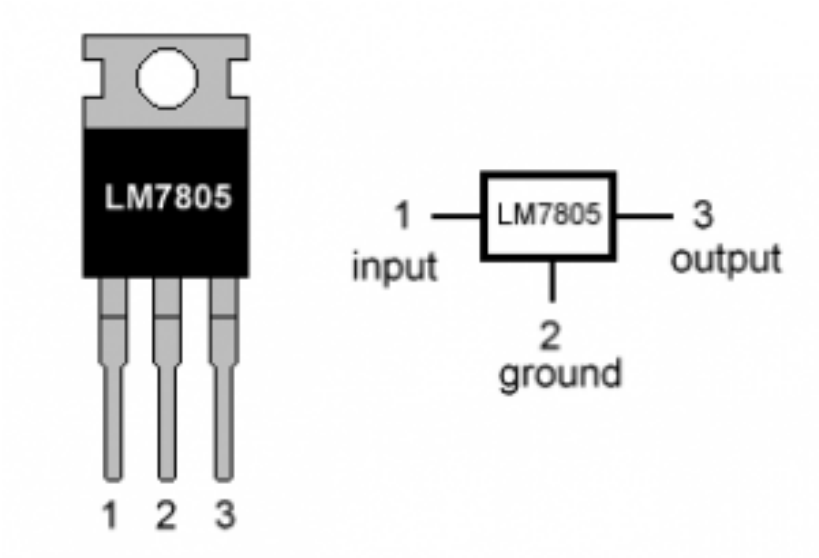


Fig: 2.6 Voltage Regulator IC.

2.8 Display Module

A liquid-crystal display is a flat panel display, electronic visual display, or video display that uses the light modulating properties of liquid crystals. Liquid crystals do not emit light directly. Here, in this able we're going to use a monochromatic 16x2 alphanumeric LCD. 16x2 means that 16 characters can be displayed in each of the 2 rows of the 16x2 LCD, thus a total of 32 characters can be displayed at any instance of time.

This 16x2 Character LCD Display is built-in with RW1063 controller IC which are 6800, 2 line SPI or I2C interface options. The WH2004G 16x2 LCD Display have the

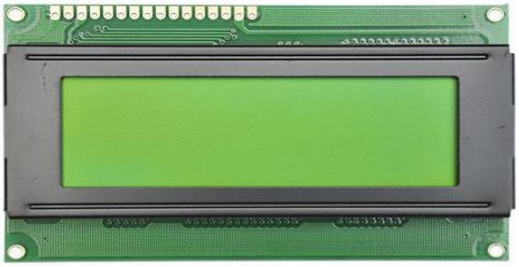


Fig: 2.7 16x2 LCD Display.

same AA size and pin assignment as existing WH2004A and WH2004B character LCD modules but with smaller outline and VA size.

2.8.1 Specification of LCD Display

Pin No	Symbol	Description
1	V_{SS}	Ground
2	V_{DD}	Power Supply
3	V_0	Contrast Adjustment
4	RS	Data / Instruction select signal
5	R/W	Read / Write Signal
6	E	Enable Signal
7-14	D0-D7	Data Bus line
15	A	Back kit LED Anode pin
16	K	Back kit LED Cathode pin

Table: 2.6 Specification of LCD Display.

2.9 Power Switch

In electrical designing, a switch is an electrical segment that can "make" or "break" an electrical circuit, interfering with the flow or redirecting it starting with one conduit then onto the next. The system of a switch expels or reestablishes the directing way in a circuit when it is worked. A switch will have at least one arrangements of contacts, which may work at the same time, successively, or on the other hand. Switches in powerful circuits must work quickly to counteract ruinous arcing, and may incorporate unique highlights to aid quickly intruding on a substantial current.



Fig: 2.8 Power Switch.

2.10 Power Connector

Barrel connectors are ordinarily found on minimal effort purchaser hardware which can be connected to divider control by means of massive AC divider connectors. Divider connectors are generally accessible, in an assortment of intensity evaluations and voltages, making barrel connectors a typical means for interfacing capacity to little tasks. The female barrel connector can be obtained in a few assortments: PCB mounted link mount, or board mount. A portion of these connectors will have an extra contact that enables the application to identify whether a power supply is connected to the barrel jack or not, in this manner enabling the gadget to sidestep batteries and spare battery life when running on outside power. [16]

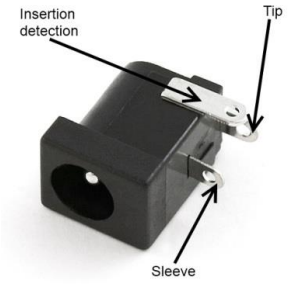


Fig: 2.9 Power Connector Port.

2.11 Diode

Diode, an electrical component that allows the flow of current in only one direction. In circuit diagrams, a diode is represented by a triangle with a line across one vertex. The most common type of diode uses a *p*-*n* junction. In this type of diode, one material ‘N’ in which electrons are charge carriers abuts a second material ‘P’ in which holes (places depleted of electrons that act as positively charged particles) act as charge carriers. At their interface, a depletion region is formed across which electrons diffuse to fill holes in the *P*-side. This stops the further flow of electrons. When this

junction is forward biased (that is, a positive voltage is applied to the *P*-side), electrons can easily move across the junction to fill the holes, and a current flows through the diode. When the junction is reverse biased (that is, a negative voltage is applied to the *P*-side), the depletion region widens and electrons cannot easily move across. The current remains very small until a certain voltage (the breakdown voltage) is reached and the current suddenly increases.

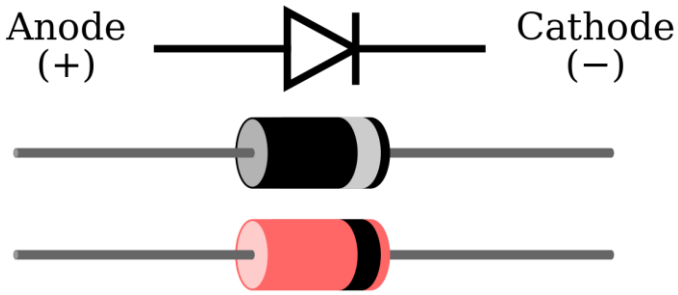


Fig: 2.10 Diode.

2.12 Resistor

A resistor is a passive two-terminal electrical component that implements electrical resistance as a circuit element. In electronic circuits, resistors are used to reduce current flow, adjust signal levels, to divide voltages, bias active elements, and terminate transmission lines, among other uses. High-power resistors that can dissipate many watts of electrical power as heat, may be used as part of motor controls, in power distribution systems, or as test loads for generators. Fixed resistors have resistances that only change slightly with temperature, time or operating voltage. Variable resistors can be used to adjust circuit elements (such as a volume control or a lamp dimmer), or as sensing devices for heat, light, humidity, force, or chemical activity.

Resistors are common elements of electrical networks and electronic circuits and are ubiquitous in electronic equipment. Practical resistors as discrete components can be composed of various compounds and forms. Resistors are also implemented within integrated circuits. The electrical function of a resistor is specified by its resistance: common commercial resistors are manufactured over a range of more than nine orders of magnitude. The nominal value of the resistance falls within the manufacturing tolerance, indicated on the component.

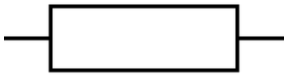


Fig: 2.11 Fixed Resistor Symbol.



Fig: 2.12 Fixed Resistor Symbol (ANSI).

2.13 Capacitor

A capacitor is a device that stores electrical energy in an electric field. It is a passive electronic component with two terminals. The effect of a capacitor is known as capacitance. While some capacitance exists between any two electrical conductors in proximity in a circuit, a capacitor is a component designed to add capacitance to a circuit. The capacitor was originally known as a condenser. This name and its cognates are still widely used in many languages, but rarely in English, one notable exception being condenser microphones, also called capacitor microphones.[8]

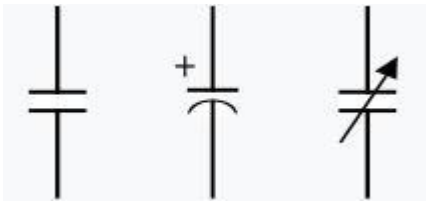


Fig: 2.13 Symbol of Capacitor.

The physical form and construction of practical capacitors vary widely and many types of capacitor are in common use. Most capacitors contain at least two electrical conductors often in the form of metallic plates or surfaces separated by a dielectric medium. A conductor may be a foil, thin film, sintered bead of metal, or an electrolyte. The non-conducting dielectric acts to increase the capacitor's charge capacity. Materials commonly used as dielectrics include glass, ceramic, plastic film, paper, mica, air, and oxide layers. Capacitors are widely used as parts of electrical circuits in many common electrical devices. Unlike a resistor, an ideal capacitor does not dissipate energy, although real-life capacitors do dissipate a small amount. When an electric potential, a voltage, is applied across the terminals of a capacitor, for example when a capacitor is connected across a battery, an electric field develops across the dielectric, causing a net positive charge to collect on one plate and net



Fig: 2.14 Different Type of Capacitors.

negative charge to collect on the other plate. No current actually flows through the dielectric. However, there is a flow of charge through the source circuit. If the condition is maintained sufficiently long, the current through the source circuit ceases. If a time-varying voltage is applied across the leads of the capacitor, the source experiences an ongoing current due to the charging and discharging cycles of the capacitor. [9]

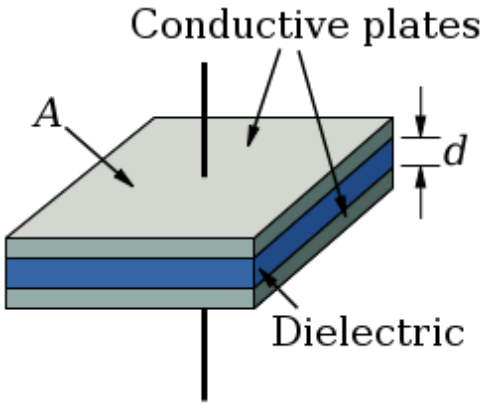


Fig: 2.15 Internal Architecture of Capacitor.

Capacitance is defined as the ratio of the electric charge on each conductor to the potential difference between them. The unit of capacitance in the International System of Units (SI) is the farad (F), defined as one coulomb per volt (1 C/V). Capacitance values of typical capacitors for use in general electronics range from about 1 pico-farad (pF) (10^{-12} F) to about 1 mille-farad (mF) (10^{-3} F). [22]

$$C = \frac{Q}{V}$$

An ideal capacitor is characterized by a constant capacitance C, in farads in the SI system of units, defined as the ratio of the positive or negative charge Q on each conductor to the voltage V between them.

A capacitance of one farad (F) means that one coulomb of charge on each conductor causes a voltage of one volt across the device. Because the conductors are close together, the opposite charges on the conductors attract one another due to their electric fields, allowing the capacitor to store more charge for a given voltage than when the conductors are separated, yielding a larger capacitance. In practical devices, charge build-up sometimes affects the capacitor mechanically, causing its capacitance to vary. In this case, capacitance is defined in terms of incremental changes. [22]

$$C = \frac{\mathrm{d}Q}{\mathrm{d}V}$$

2.14 Transistor

A transistor is a semiconductor device used to amplify or switch electronic signals and electrical power. It is composed of semiconductor material usually with at least three terminals for connection to an external circuit. A voltage or current applied to one pair of the transistor's terminals controls the current through another pair of terminals. Because the controlled (output) power can be higher than the controlling (input) power, a transistor can amplify a signal. Today, some transistors are packaged individually, but many more are found embedded in integrated circuits.

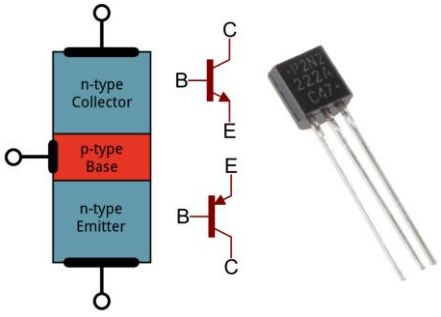


Fig: 2.16 Symbol & Internal Layer of Transistor.

Austro-Hungarian physicist Julius Edgar Lilienfeld proposed the concept of a field-effect transistor in 1926, but it was not possible to actually construct a working device at that time.[1] The first working device to be built was a point-contact transistor invented in 1947 by American physicists John Bardeen and Walter Brattain while working under William Shockley at Bell Labs. They shared the 1956 Nobel Prize in Physics for their achievement.[2] The most widely used transistor

is the MOSFET (metal–oxide–semiconductor field-effect transistor), also known as the MOS transistor, which was invented by Egyptian engineer Mohamed Atalla with Korean engineer Dawon Kahng at Bell Labs in 1959.[3][4][5] The MOSFET was the first truly compact transistor that could be miniaturized and mass-produced for a wide range of uses.[11]

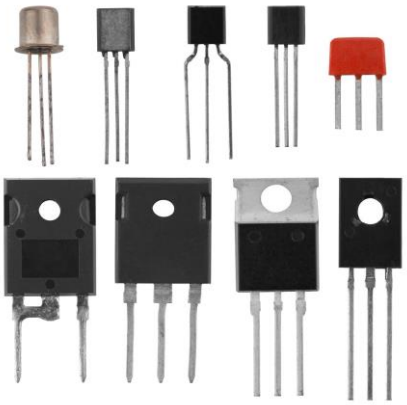


Fig: 2.17 Different Type of Transistor.

Transistors revolutionized the field of electronics, and paved the way for smaller and cheaper radios, calculators, and computers, among other things. The first transistor and the MOSFET are on the list of IEEE milestones in electronics. The MOSFET is the fundamental building block of modern electronic devices, and is ubiquitous in modern electronic systems. An estimated total of 13 sextillion MOSFETs have been manufactured between 1960 and 2018 (at least 99.9% of all transistors), making the MOSFET the most widely manufactured device in history.[11]

Most transistors are made from very pure silicon, and some from germanium, but certain other semiconductor materials can also be used. A transistor may have only one kind of charge carrier, in a field-effect transistor, or may have two kinds of charge carriers in bipolar junction transistor devices. Compared with the vacuum tube, transistors are generally smaller, and require less power to operate. Certain vacuum tubes have advantages over transistors at very high operating frequencies or high operating voltages. Many types of transistors are made to standardized specifications by multiple manufacturers.

2.15 Vero Board

Strip board is the generic name for a widely used type of electronics prototyping board characterized by a 0.1 inch (2.54 mm) regular (rectangular) grid of holes, with wide parallel strips of copper cladding running in one direction all the way across one side

of the board. It is commonly also known by the name of the original product Vero board, which is a trademark, in the UK, of British company Vero Technologies Ltd and Canadian company Pixel Print Ltd. In using the board, breaks are made in the tracks, usually around holes, to divide the strips into multiple electrical nodes. With care, it is possible to break between holes to allow for components that have two pin rows only one position apart such as twin row headers for IDCs.

Strip board is not designed for surface-mount components, though it is possible to mount many such components on the track side, particularly if tracks are cut/shaped with a knife or small cutting disc in a rotary tool.

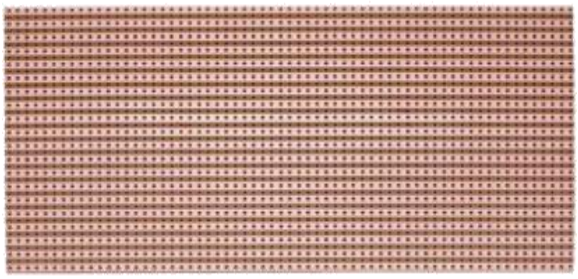


Fig: 2.18 Vero Board.

2.16 Connecting Wire

A wire is a single, usually cylindrical, flexible strand or rod of metal. Wires are used to bear mechanical loads or electricity and telecommunications signals. Wire is commonly formed by drawing the metal through a hole in a die or draw plate. Wire gauges come in various standard sizes, as expressed in terms of a gauge number. The term *wire* is also used more loosely to refer to a bundle of such strands, as in 'multi stranded wire', which is more correctly termed a wire rope in mechanics, or a cable in electricity.

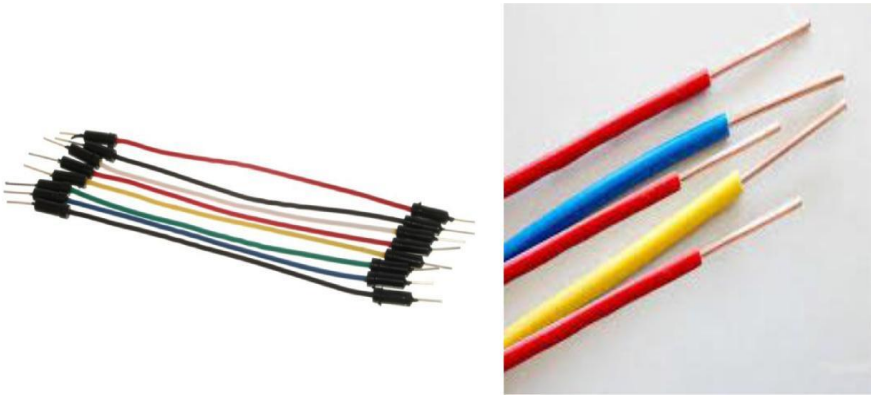


Fig: 2.19 Connecting Wire.

2.17 Arduino IDE

The Arduino Integrated Development Environment or Arduino Software (IDE) contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuino hardware to upload programs and communicate with them.

Programs written using Arduino Software are called sketches**.** These sketches are written in the text editor and are saved with the file extension .ino. The editor has features for cutting/pasting and for searching/replacing text. The message area gives feedback while saving and exporting and also displays errors. The console displays text output by the Arduino Software, including complete error messages and other information. The bottom right-hand corner of the window displays the configured board and serial port. The toolbar buttons allow you to verify and upload programs, create, open, and save sketches, and open the serial monitor.

2.17.1 How to use Arduino IDE

- New
  Creates a new instance of the editor, with the bare minimum structure of a sketch already in place.
- Open
  Allows to load a sketch file browsing through the computer drives and folders.
- Open Recent
  Provides a short list of the most recent sketches, ready to be opened.
- Sketchbook
  Shows the current sketches within the sketchbook folder structure; clicking on any name opens the corresponding sketch in a new editor instance.
- Examples
  Any example provided by the Arduino Software (IDE) or library shows up in this menu item. All the examples are structured in a tree that allows easy access by topic or library.
- Close
  Closes the instance of the Arduino Software from which it is clicked.
- Save
  Saves the sketch with the current name. If the file hasn't been named before, a name will be provided in a "Save as.." window.
- Save as...
  Allows to save the current sketch with a different name.
- Page Setup
  It shows the Page Setup window for printing.

- Print
  Sends the current sketch to the printer according to the settings defined in Page Setup.
- Preferences
  Opens the Preferences window where some settings of the IDE may be customized, as the language of the IDE interface.
- Quit
  Closes all IDE windows. The same sketches open when Quit was chosen will be automatically reopened the next time you start the IDE.

2.18 Proteus

The Proteus Design Suite is a proprietary software tool suite used primarily for electronic design automation. The software is used mainly by electronic design engineers and technicians to create schematics and electronic prints for manufacturing printed circuit boards.

It was developed in Yorkshire, England by Labcenter Electronics Ltd and is available in English, French, Spanish and Chinese languages.

The first version of what is now the Proteus Design Suite was called PC-B and was written by the company chairman, John Jameson, for DOS in 1988. Schematic Capture support followed in 1990, with a port to the Windows environment shortly thereafter. Mixed mode SPICE Simulation was first integrated into Proteus in 1996 and microcontroller simulation then arrived in Proteus in 1998. Shape based auto-routing was added in 2002 and 2006 saw another major product update with 3D Board Visualization. More recently, a dedicated IDE for simulation was added in 2011 and MCAD import/export was included in 2015. Support for high speed design was added in 2017.

2.19 Summary

The components used are studied individually. Their purpose in the system is explained along with their ratings, pinouts and connections.

Chapter III
Hardware Development

3.1 Introduction

This chapter will be explaining about the construction of RFID based Toll collection systems. This system has three section;

i. Card Reading Section.
ii. Vehicle Detecting Section.
iii. Display Section.

3.2 Block Diagram:

The RFID based Toll and Tax Collection Systems block diagram are shown in below;

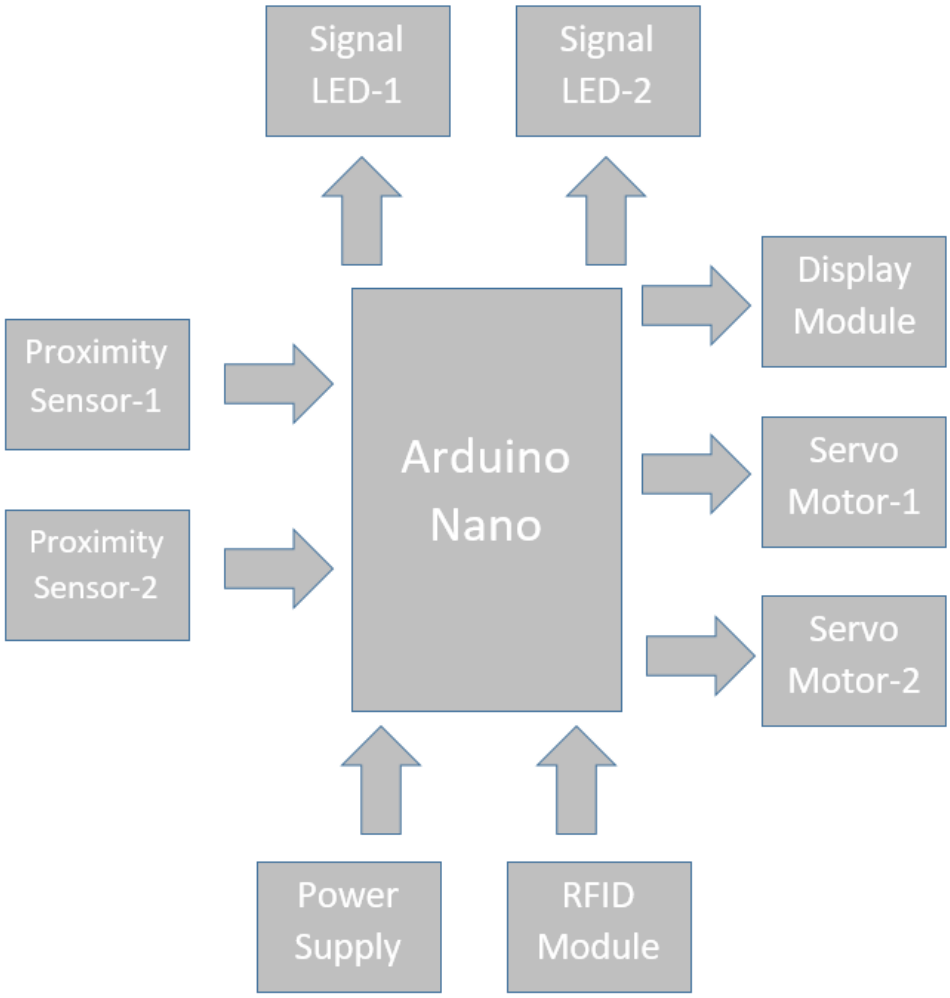


Fig: 3.1 Block Diagram of RFID Based Toll Collection System.

In figure 3.1 there are some block for RFID based toll collection system, there are two proximity sensor's block, which is mainly IR Proximity sensor. This sensor is detect vehicle in toll plaza for punching RFID tag.

In upside there are two signal LED's block, this LED's represent two types of signal; number one is green signal for gate open. And number two is red signal for gate close.

In right side, there are two servo motor blocks; these motors are controlling two gate. There are another block; whish is Display, this display is showing some information according to RFID tag's.

In bottom side there are two block; number one is power supply and number two is RFID module, power supply is give biasing power for run hole system, normally DC 5V is used for RFID based tolling system.

There are another block, this block is RFID module blocks, which is read RFID tag's and transfer data to arduino chips.

Final block is Arduino nano's block, which is main control unit, arduino is a developer board which is a microcontroller unit.

3.3 Designing Software

There are many circuit deigning software, we prefer "Proteus Design Suite" for deign our circuit. The Proteus Design Suite is a proprietary software tool suite used primarily for electronic design automation. The software is used mainly by electronic design engineers and technicians to create schematics and electronic prints for manufacturing printed circuit boards.

It was developed in Yorkshire, England by Labcenter Electronics Ltd and is available in English, French, Spanish and Chinese languages.

Schematic capture in the Proteus Design Suite is used for both the simulation of designs and as the design phase of a PCB layout project. It is therefore a core component and is included with all product configurations.

3.4 Circuit Diagram

Circuit diagram of "RFID Based Toll Collection System" is shown in below.

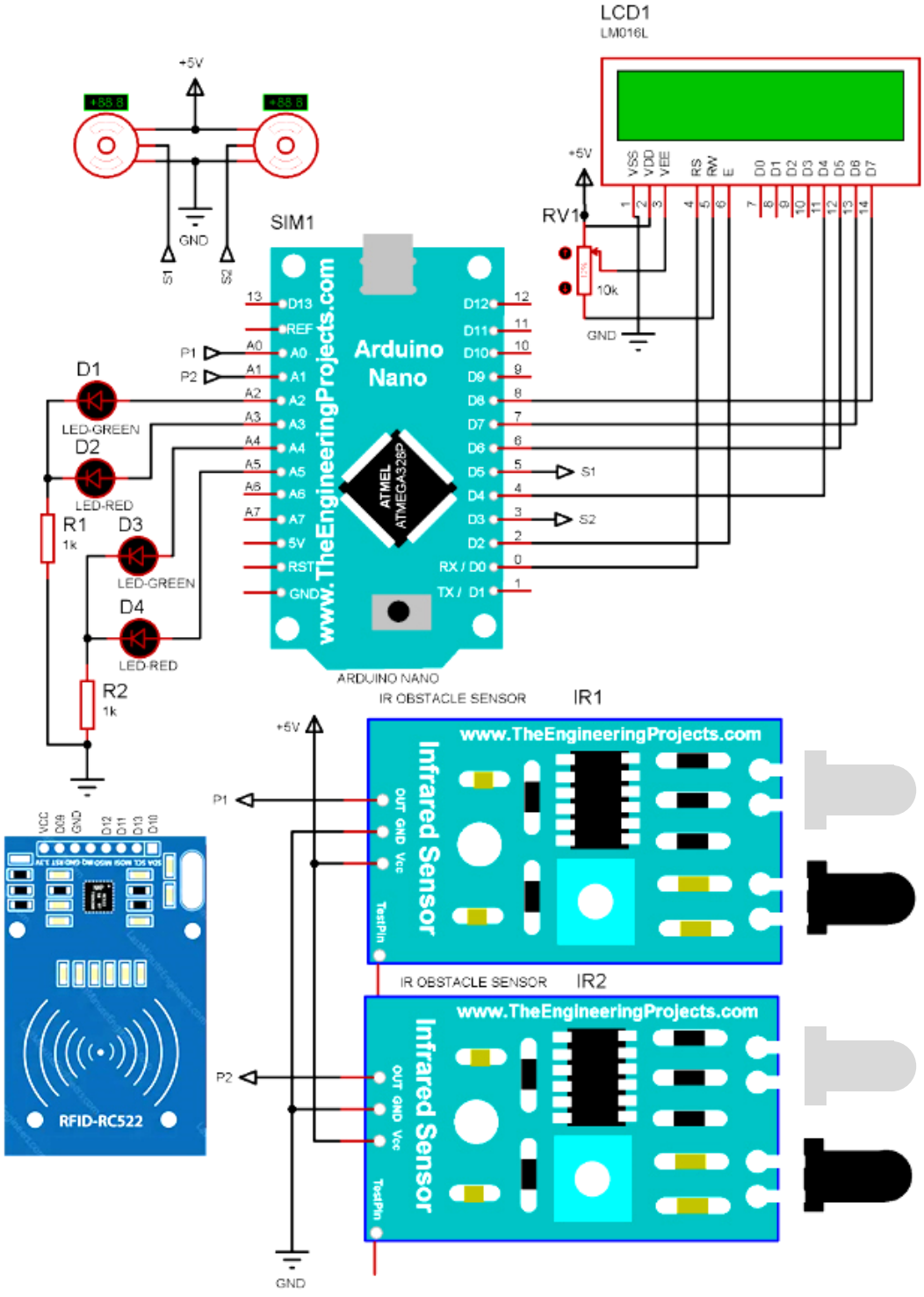


Fig: 3.2 Circuit Diagram of RFID Based Toll Collection System.

3.5 Construction of main Circuit

At first we need to collect all equipment and component as list in chapter-2. Then we should arrange all component as shown in figure: 3.4. we use Arduino nano as a main component. At first we interface RFID module with arduino, RFID module has total 8 pin's. Number-1 is VCC pin which is connected with common +5V DC source. Number-2 is reset (RST) pin, which is connected with arduino's pin number D9. Number-3 is pin which is connected with common ground. Number-4 not connected. Number-5 is MISO (Master In Slave Out) pin which is connect with arduino's pin number D12. Number-6 is MOSI (Master Out Slave In) pin which is connect with arduino's pin number D11. Number-7 is SCL pin which is connect with arduino's pin number D13. Number-8 is SDA pin which is connect with arduino's pin number D10.

After connecting RFID module, we attached Proximity sensor with arduino. Both proximity sensor has 3 pin's. number-1 is data pin, data pin-1 is connected with arduino's pin number A0, and data pin-2 is connected with arduino's pin number A1, number-2 is GND pin which is connected with common ground. And last pin is VCC which is connect with Common DC 5V.

We connect two green LED's and two red LED's for road signal. We connect green-1 LED with arduino's pin number A2 and green-2 LED is connected with arduino's pin number A4.

Similarly, red-1 is connected with arduino's pin number A3 and red-2 is connected with arduino's pin number A5.

Now it's time to attached servo motor. We attached two servo motor for two gate's. per servo motor has three pin's. number-1 is VCC ,which is connected with DC 5V. number-2 is GND, which is connected with common ground. And last pin is data pin, which pin is control servo angle. This pin is connected with arduino's pin number D5 and D3.

Finally we connect LCD display. This display has total 16 pin's.

Pin number-1 is VSS, we connect this pin with common ground. Pin number-2 is VDD, we connect this pin with DC 5V. Pin number-3 is VEE, we connect this pin with 10k potentiometer. Pin number-4 is RS (Reset), we connect this pin with Arduino's digital pin D0. Pin number-5 is RW (Read/Write), we connect this pin with common ground.

Pin number-6 is E (Enable), we connect this pin with Arduino's digital pin D2. Pin number-7 (D0) to pin number-10 (D3) is not connected. Pin number-11 is D4 (Data-4), we connect this pin with Arduino's digital pin D4. Pin number-12 is D5 (Data-5), we connect this pin with Arduino's digital pin D6. Pin number-13 is D6 (Data-6), we connect this pin with Arduino's digital pin D7. Pin number-14 is D7 (Data-7), we connect this pin with Arduino's digital pin D8. Pin number-15 is backlight led positive pin, we connect this pin with 100 ohm resistor. And pin is backlight led negative pin, we connect this pin with common ground.

3.6 Working Principle

When we connect our toll plaza to power source, program will be start and check gate status. Then servo will be in 0 degree that mean gate will be closed. Proximity sensor allows check vehicle availability. If detect any vehicle then transfer a micro signal to arduino. On top side, RFID module allows check RFID tag availability, if available any tag, then arduino program will check this card for registered member. If scanned tag is matched with any resisted member, then toll plaza give access for passing gate. Otherwise, gate stay close. On top side LCD display is showing all information about RFID tag or vehicle.

3.7 Hardware Image

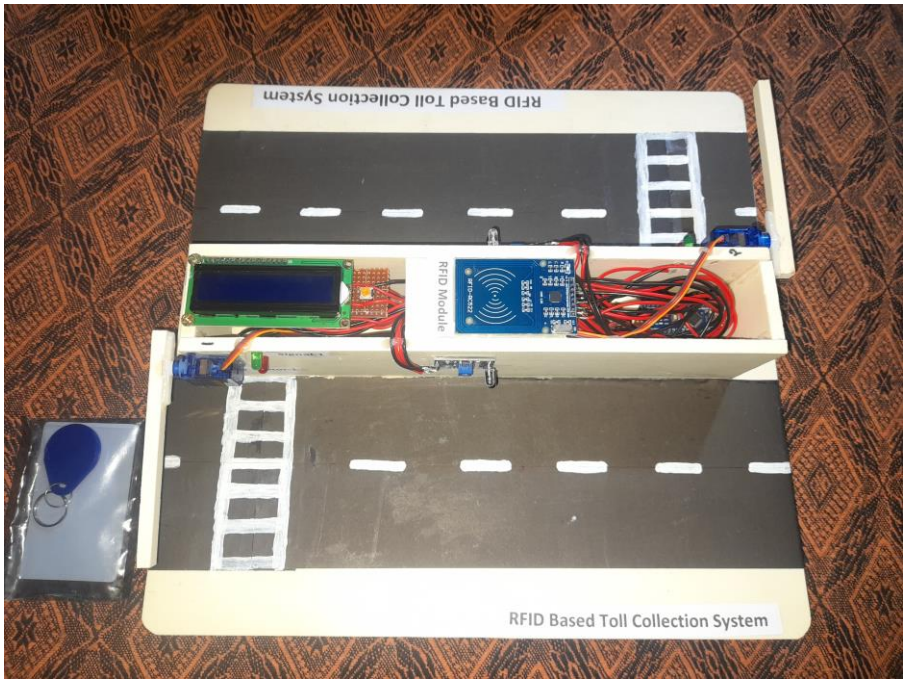


Fig: 3.3 Hardware image of RFID Based Toll Collection System.

3.8 Summary

A circuit diagram (electrical diagram, elementary diagram, electronic schematic) is a graphical representation of an electrical circuit. A pictorial circuit diagram uses simple images of components, while a schematic diagram shows the components and interconnections of the circuit using standardized symbolic representations. The presentation of the interconnections between circuit components in the schematic diagram does not necessarily correspond to the physical arrangements in the finished device.

CHAPTER IV
RESULT AND DISCUSSION

4.1 Introduction

Most Toll plaza have old toll tax collection system, in old system there is many problem like, time wastage, fuel wastage, road jamming, plaza robbery etc. by this cause we make a perfect digital toll plaza for our modern life. We make a RFID based tolling system, which faster than cashing system, and easier than casual system. There is no cash no robbery.

This chapter will present all the results, calculations, and relevant discussions.

4.2 Result

The experimental model was made according to the circuit diagram, and the results were as expected. Oure Proximity sensor detect vehicle perfectly, and our tag scanner was scan RFID without any error. Servo motor is working smoothly. Our controller and display was working perfectly, our display showing Authentication and rejection .

4.3 Advantages

1. This system can safe time for tolling.
2. It can reduced fuel wastage.
3. Maintaining cost is very low.
4. It can save our money for labor power.
5. Fully automatic system.

4.4 Disadvantage

1. Initial cos high.
2. Installation process is difficult.
3. Programing can also take longer time to accomplish than circuit analysis.
4. Error in the programming is possible.

4.5 Cost Estimation of the Project

Serial No	Particulars	Quantity	Cost in BDT
01	Arduino Nano	1	1600
02	RFID Module	1	750
03	Proximity Sensor	2	440
04	Servo Motor	2	680
05	Voltage Regulator IC	1	20
06	LCD Display	1	380
07	Resistor 1k ohm	4	8
08	LED red	2	10
09	LED green	2	10
10	Vero Board	1	25
11	Power Switch	1	30
12	Rail (I & L)	2	50
13	Soldering lead	2	50
14	Glue Strike	1	25
15	PVC Board	1	180
		Total =	**4258**

Table: 4.1 Price list and component quantity.

4.6 Application

1. Jamuna Setu Toll Plaza.
2. Padma River Bridge Toll Plaza.
3. All king of toll plaza.

4.7 Summary

The conventional toll plaza was wasting time for travel time. Also wastage fuel for toll collection time. We can save time and fuel by using this tolling system.

CHAPTER V
CONCLUTION

5.1 Conclusions

The Electronic Toll Collection system in expressway based on RFID, a design scheme was put forward. It is low cost, high security, far communication and efficiency, etc. It not only improves the passage ability of expressway but also improves the technology level of charge. Electronic toll collection system using RFID is an effective measure to reduce management costs and fees, at the same time, greatly reduce noise and pollutant emission of toll station. In the design of the proposed Electronic toll collection (ETC) system, real time toll collection and anti-theft solution system have been designed. This reduces the manual labor and delays that often occur on roads. This system of collecting tolls is eco friendly and also results in increased toll lane capacity. Also an anti-theft solution system module which prevents passing of any defaulter vehicle is implemented, thus assuring security on the roadways.

5.2 Future Scopes of Modification

1. Automatic Vehicle Identification: The automatic vehicle identification (AVI) component of this system refers to the technologies that determine the identification or ownership of the vehicle so that the toll will be charged to the corresponding customer. 2. Automatic Vehicle Classification: Vehicle type and class may have differentiated toll amount. The vehicle type may include light vehicles like the passenger car or heavy vehicles like recreational vehicles. A vehicle's class can be determined by the physical attributes of the vehicle, the number of occupants in the vehicle, the number of axles in the vehicles and the purpose for which the vehicle is being used at the time of classification 3. Video Enforcement System: When used for electronic toll collection, the video enforcement system (VES) captures images of the license plates of vehicles that pass through an electronic tollbooth without a valid electronic tag. Although the deployment of these technologies makes the initial cost of installation very high, but there exits huge benefits accompanied with such high investment. These benefits are discussed in the upcoming section.

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APPENDIX

Controller Code:

```
#include <SPI.h>
#include <MFRC522.h>
#include <LiquidCrystal.h>
#include <Servo.h>
#define h_t 3000
#define o_t 3000

#define SS_PIN 10
#define RST_PIN 9
MFRC522 mfrc522(SS_PIN, RST_PIN);
LiquidCrystal lcd (0,2,4,6,7,8); // Rs, E, D4, D5, D6, D7
Servo myServo_1;
Servo myServo_2;

int proxy_1 = A0;
int proxy_2 = A1;

int green_1 = A2;
int red_1 = A3;
int green_2 = A4;
int red_2 = A5;
```

```
void setup()
{
 // Serial.begin(9600);
  lcd.begin(16, 2);
  myServo_1.attach(5);
  myServo_2.attach(3);
  SPI.begin();
  mfrc522.PCD_Init();
  //Serial.println("Please Scan Your Card");
  //Serial.println();

  pinMode(proxy_1, INPUT);
  pinMode(proxy_2, INPUT);

  pinMode(green_1, OUTPUT);
  pinMode(red_1, OUTPUT);
  pinMode(green_2, OUTPUT);
  pinMode(red_2, OUTPUT);

  lcd.clear();
  lcd.setCursor(4,0);
  lcd.print("Sonargaon");
  lcd.setCursor(1,1);
```

```
  lcd.print("University (SU)");
  delay(h_t);

  lcd.clear();
  lcd.setCursor(0,0);
  lcd.print("RFID Based Toll");
  lcd.setCursor(0,1);
  lcd.print("Collection Systm");
  delay(h_t);

  digitalWrite(green_1, LOW);
  digitalWrite(red_1, HIGH);
  digitalWrite(green_2, LOW);
  digitalWrite(red_2, HIGH);
  myServo_1.write(0);
  myServo_2.write(0);

}
void loop()
{
  lcd.clear();
  lcd.setCursor(0,0);
  lcd.print("Please Scan Your");
  lcd.setCursor(3,1);
```

```
lcd.print("RFID Card");
delay(100);


if ( ! mfrc522.PICC_IsNewCardPresent())
{
  return;
}
if ( ! mfrc522.PICC_ReadCardSerial())
{
  return;
}
// Serial.print("UID tag :");
String content= "";
byte letter;
for (byte i = 0; i < mfrc522.uid.size; i++)
{
   //Serial.print(mfrc522.uid.uidByte[i] < 0x10 ? " 0" : " ");
  // Serial.print(mfrc522.uid.uidByte[i], HEX);
   content.concat(String(mfrc522.uid.uidByte[i] < 0x10 ? " 0" : " "));
   content.concat(String(mfrc522.uid.uidByte[i], HEX));
}
//Serial.println();
//Serial.print("Message : ");
content.toUpperCase();
```

```
if (content.substring(1) == "23 7F 67 13")
{
//  Serial.println("Car Detected");
//  Serial.println("Authorized access");
//  Serial.println();

  lcd.clear();
  lcd.setCursor(3,0);
  lcd.print("Authorized");
  lcd.setCursor(5,1);
  lcd.print("Access");
  delay(1000);

  if((digitalRead(proxy_1) == HIGH) && (digitalRead(proxy_2) == HIGH))
  {
    lcd.clear();
    lcd.setCursor(2,0);
    lcd.print("Please Move");
    lcd.setCursor(2,1);
    lcd.print("Your Vehicle");
    delay(2000);
  }

  if ((digitalRead(proxy_1) == LOW))
```

```
{
  lcd.clear();
  lcd.setCursor(0,0);
  lcd.print("Gate Is Opening");
  lcd.setCursor(1,1);
  lcd.print("Please Wait...");
 // delay(1000);
  digitalWrite(green_1, HIGH);
  digitalWrite(red_1, LOW);
  myServo_1.write(90);
  delay(o_t);
  digitalWrite(green_1, LOW);
  digitalWrite(red_1, HIGH);
  myServo_1.write(0);
}

if ((digitalRead(proxy_2) == LOW))
{
  lcd.clear();
  lcd.setCursor(0,0);
  lcd.print("Gate Is Opening");
  lcd.setCursor(1,1);
  lcd.print("Please Wait...");
  //delay(1000);
```

```
    digitalWrite(green_2, HIGH);
    digitalWrite(red_2, LOW);
    myServo_2.write(90);
    delay(o_t);
    digitalWrite(green_2, LOW);
    digitalWrite(red_2, HIGH);
    myServo_2.write(0);
  }
}

if (content.substring(1) != "23 7F 67 13")
{
 // Serial.println("Unknown Vehicle");
 // Serial.println("Access denied");
  //Serial.println();

  lcd.clear();
  lcd.setCursor(2,0);
  lcd.print("Access Denied");
  lcd.setCursor(0,1);
  lcd.print("Gate Stay Closed");
  delay(10);

    digitalWrite(red_1, HIGH);
```

```
    digitalWrite(red_2, HIGH);
    digitalWrite(green_1, LOW);
    digitalWrite(green_2, LOW);
    myServo_1.write(0);
    myServo_2.write(0);
    delay(o_t);
  }

  else
  {
   // Serial.println("Scan Your RFID");
    //Serial.println("");

    lcd.clear();
    lcd.setCursor(0,0);
    lcd.print("Please Scan Your");
    lcd.setCursor(3,1);
    lcd.print("RFID Card");
    delay(100);
  }
}
```