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"Jnana Sangama", Belagavi, Karnataka, INDIA

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A Mini Project Report on

"SMART SHOPPING TROLLEY WITH AUTOMATED BILLING SYSTEM"

Submitted in partial fulfillment of the requirement for the award of the degree of

Bachelor of Engineering

in

Electrical and Electronics Engineering

Submitted By

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2022 – 2023

GLOBAL ACADEMY OF TECHNOLOGY

(An Autonomous Institute Affiliated to VTU)

Department of Electrical and Electronics Engineering

CERTIFICATE

Certified that the Project Entitled **"SMART SHOPPING TROLLEY WITH AUTOMATED BILLING SYSTEM"** carried out by **SHASHANK KUMAR MK (1GA20EE043), SUMAN S AMBIGER (1GA20EE046), MONISHA A (1GA21EE405),** bonafide students of Global Academy of Technology, is in partial fulfillment for the award of the **BACHELOR OF ENGINEERING** in Electrical and Electronics Engineering from **Visvesvaraya Technological University, Belagavi** during the year **2022-2023**. It is certified that all the corrections/suggestions indicated for Internal Assessment have been incorporated in the report submitted in the department library.

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DECLARATION

We, **SHASHANK KUMAR MK (1GA20EE043), SUMAN S AMBIGER (1GA20EE046), MONISHA A (1GA21EE405),** students of Sixth Semester B.E, Department of Electrical and Electronics Engineering, Global Academy of Technology, Rajarajeshwari Nagar, Bengaluru, declare that the Project Work entitled **"SMART SHOPPING TROLLEY WITH AUTOMATED BILLING SYSTEM"** has been carried out by us and submitted in partial fulfillment of the course requirements for the award of degree in **Bachelor of Engineering in Electrical and Electronics Engineering** from **Visvesvaraya Technological University, Belagavi** during the academic year **2022-23**. The matter embodied in this report has not been submitted to any other university or institution for the award of any other degree.

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Place: Bengaluru

Date:

ABSTRACT

The Smart Shopping Trolley with Automated Billing and Electric Vehicle (EV) Charging Integration is a cutting-edge innovation that transforms the traditional shopping experience into a seamless and eco-friendly process. This system addresses several key challenges faced by both consumers and retailers in today's modern retail landscape. Smart Shopping Trolley: The core component of this system is the smart shopping trolley equipped with advanced technologies. These trolleys are embedded with IoT sensors, RFID (Radio-Frequency Identification) scanners, and a touchscreen display. They provide customers with real-time product information, navigation assistance within the store, and the ability to scan and add items to their virtual shopping cart.

Automated Billing: As customers place items in their smart trolley, the system automatically tallies the total cost in real-time. Customers can review their purchases on the built-in touchscreen display, allowing for a hassle-free and transparent shopping experience. When customers are ready to check out, they can securely complete the payment process directly from the trolley.

EV Charging Integration: One of the standout features of this system is the integration of EV charging stations into the shopping trolley. Customers can park their electric vehicles in designated areas equipped with charging infrastructure. The smart trolley detects the EV's presence and begins charging automatically, eliminating the need for separate charging stations and making it convenient for customers to recharge while they shop. Energy Efficiency: The system is designed with energy efficiency in mind. The trolleys use rechargeable batteries to power their features, and the EV charging infrastructure is optimized for minimal energy wastage. This not only reduces the environmental footprint but also lowers operational costs for retailers.

ACKNOWLEDGEMENT

The fulfilment and rapture that go with the fruitful finishing of any assignment would be inadequate without the specifying the people who made it conceivable, whose steady direction and support delegated the endeavors with success. Although it is not possible to thank all the members who helped for the completion of the Project Work individually, we take this opportunity to express our gratitude to one and all.

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Last, but not least, we owe our debts to our parents, friends and also those who directly or indirectly have helped us to make the Project Work a success.

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ABBREVIATIONS USED

RFID	Radio Frequency Identification
GSM	Global System for Mobile communication
LCD	Liquid Crystal Display

Chapter 1 INDROTUCTION

1.1Description:

The "Smart Shopping Trolley with Automated Billing System" represents a groundbreaking shopping solution that leverages advanced technology to streamline and enhance the shopping process. This innovative system reimagines the traditional shopping cart, making it intelligent and interactive.

The smart shopping trolley is equipped with sensors and RFID (Radio-Frequency Identification) technology, allowing it to identify and track items placed inside the cart automatically. This eliminates the need for manual scanning of products.

As shoppers add or remove items from the trolley, the system updates the virtual shopping cart in real-time. This provides shoppers with an up-to-date list of their selected items and the total cost.

The trolley features a user-friendly interface, typically a touchscreen display, where shoppers can view their selected items, check prices, and access product information, making informed decisions while shopping.

At the end of their shopping trip, customers can proceed to the automated billing station. This station securely processes payments using various methods, including mobile apps, credit cards, or other electronic payment options.

By automating the billing process, this system significantly reduces the time shoppers spend at checkout counters. There are no traditional queues or cashier interactions, leading to a quicker and more efficient shopping experience.

The system helps minimize errors in pricing and billing, as it relies on accurate product identification and pricing data. This reduces the likelihood of overcharging or undercharging customers.

Overall, the "Smart Shopping Trolley with Automated Billing System" aims to enhance the shopping experience by making it more convenient, efficient, and user-friendly. It simplifies the entire shopping journey, from item selection to payment, making it a game-changer in the retail industry.

1.2 Project Outline:

The "Smart Shopping Trolley with Automated Billing System" encompasses a comprehensive roadmap for the creation and evaluation of a groundbreaking retail innovation.

This initiative aims to seamlessly blend state-of-the-art hardware and software, introducing a shopping cart that not only simplifies the customer's journey but also redefines the checkout process.

The project's foundation rests on a thorough literature review, which illuminates the existing landscape of smart shopping systems and automated billing technologies.

It defines clear objectives and scope, acknowledging potential limitations while emphasizing the transformative potential of this endeavor.

In subsequent sections, the system's intricate design, hardware and software components, data flow, user interaction, testing procedures, and anticipated future enhancements will be explored, providing a holistic perspective on this cutting-edge retail solution.

Chapter 2

LITERATURE REVIEW

2.1 Proposed work and existing literature

The proposed project, titled "Smart Shopping Trolley with Automated Billing System," aims to revolutionize the shopping experience by integrating cutting-edge technology into traditional grocery carts. The project will commence with an extensive literature review to understand existing smart shopping trolley and billing systems, analyzing their features and limitations. Hardware components, including RFID scanners, sensors, arduino, and displays, will be carefully selected and seamlessly integrated into a functional shopping trolley design. On the software front, a user-friendly interface will be developed to interact with the system, allowing customers to effortlessly track items placed in the trolley using RFID technology. The core focus lies in the creation of a real-time automated billing system that calculates the total cost of items as customers shop, enabling various payment methods. Furthermore, enhancements like item recommendations and user-friendly features will be explored to enhance the shopping experience. Rigorous testing, scalability planning, cost analysis, and comprehensive documentation will ensure a successful project outcome, positioning this smart shopping trolley as an innovative solution for modern retail environments.

Research and technical papers:

2.2.1 Smart Trolley with Automated billing SystemsBy-Shridhar Mathad
(February 2022 IAES International Journal of Artificial Intelligence):
This paper proposes an implementation of feasible technology based on RFID to help customers in abundance and saves time during billing which is highly tedious task waiting for the our turn.

2.2.2 Electrically Operated Multipurpose Trolley By-Al Sult Al Kharusi , Dinesh Kelothkaithari, Muhammad Mumtaz Mirza , Parimal S. Bhambare (June 2018 IOP Conference Series Materials Science and Engineering):
Noisy less trolley, not harmful to the environment and the time period required for the transportation is less.

2.2.3 Smart Trolley with Automated billing Systems Using Arduino By-Pavni Swaroop , Akshita Parasari , Mansi Singh, Shobha Rajput (August 2022 International Journal Of Creative Research Thoughts (IJCRT):
Intelligent Smart Trolley for Automated Billing using RIFD and IOT is most certainly a definite necessity for the Retail marketing industry and cope up advancement of technology.

2.2.4 Smart Shopping Cart System By-Snehal Kulkarni ,Dr. Supriya Shanbhag
December 2022 (IJARSCT):
Smart Trolley with Automated billing with RIFD and Arduino UNO.

2.2.4 Development of Automatic Shopping Trolley in Supermarkets By-Rajini.H , Sandeep Jaiswal , Shyam Sunder Prasad , Kushboo , Anjela Kadiem(November2022 (IJAER):
Development of trolley with low power consumption.

2.2SCOPE OF THE PROJECT:

- Design and build a smart shopping trolley equipped with sensors, cameras, RFID scanners, and a display screen to interact with users.

- Develop software and hardware components that automatically scan and track items placed in the trolley, calculate the total cost, and generate an electronic bill.

- Integrate the system with the store's inventory database to ensure real-time updates on product availability and pricing.

- Create a user-friendly interface for shoppers to view the list of scanned items, make adjustments, and finalize their purchases.

- Implement various payment methods, including card payments, mobile wallets, and cash, to accommodate different customer preferences.

Chapter 3

SYSTEM REQUIREMENTS & SPECIFICATION

3.1 HARDWARE REQUIREMENTS:

SL.NO	COMPONENTS REQUIRED	QUANTITY
1	Arduino UNO	1
2	RFID Module & cards	1
3	LCD display	1
4	Cables and connectors	As per requirement
5	PCB board	1
6	LED	2
7	Adapter	1
8	GSM Module	1
9	Rechargable battery	1
10	Push button	2
11	Buzzer	1
12	Switch	1
13	Jumper wires	As per requirement
14	48v 1000W BLDC Motor	1
15	48V 1000W controller	1
16	48V Lithium ion battery	1
17	Throttle	1

3.1.1COMPONENTS WITH DESCRIPTION:

3.1.21 Arduino UNO:

The Arduino Uno is a widely used microcontroller board that is designed for building and prototyping electronic projects. It is based on the Atmega328P microcontroller and comes with a set of digital and analog input/output pins that allow you to connect and control various sensors, actuators, and other components. The board can be programmed using the Arduino IDE (Integrated Development Environment) with code written in a C/C++-like language.

Fig 1: Arduino UNO

3.1.22 Liquid Crystal Display(LCD):

A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix.

Fig 2: Liquid Crystal Display

3.1.23 EM-18 Reader Module:

The EM-18 RFID reader module is a compact electronic device used for reading RFID (Radio Frequency Identification) tags. RFID technology involves the use of electromagnetic fields to automatically identify and track tags attached to objects. The EM-18 module, operating at a frequency of 125 kHz, facilitates communication with RFID tags within its range. Components are Coil Antenna, Receiver, Circuitry, Microcontroller Interface, LED Indicators.

Fig 3: EM-18 Reader Module

3.1.24 RFID tags:

RFID (Radio-Frequency Identification) tags are small electronic devices that consist of a microchip and an antenna. They are used to store and transmit information wirelessly using radio waves. RFID tags can be attached to objects, products, or even living beings to identify and track them.

Fig 4: RFID tags

3.1.25 GSM Module(SIM800A):

The GSM SIM800A is a module used in electronics and communications that provides functionalities for GSM (Global System for Mobile Communications) and GPRS (General Packet Radio Service) communication. It's commonly used in projects that require cellular connectivity, such as sending and receiving SMS messages, making and receiving calls, and connecting to the internet over GPRS.The SIM800A module integrates a GSM modem, which allows it to communicate with cellular networks and connect to the internet using GPRS.

Fig 5:GSM Module

3.1.26 Sealed Rechargeable Battery:

A sealed rechargeable battery, also known as a sealed lead-acid (SLA) battery, is a type of rechargeable battery that uses lead-acid chemistry for energy storage. Unlike traditional lead-acid batteries, sealed rechargeable batteries are designed with a sealed construction, meaning they do not require regular maintenance like adding water to the cells. The sealed construction prevents the escape of gases produced during charging and discharging, which makes them safer to use in enclosed spaces and reduces the risk of leakage. These batteries are often used in applications where maintenance-free operation, safety, and ease of use are important factors.

Fig 6: Sealed Rechargeable Battery

3.1.27 LEDs:

LEDs, or Light Emitting Diodes, are semiconductor devices that emit light when an electric current passes through them. They are used in various applications like lighting, displays, indicators, and more due to their energy efficiency, longevity, and compact size.

Fig 7: LEDs

3.1.28 Buzzer:

A buzzer is an electrical device that produces a sound or tone when an electric current passes through it. It's commonly used as a simple signaling or alerting mechanism in various applications such as alarms, doorbells, and games. The sound produced by a buzzer can vary in pitch and volume depending on its design and the current passing through it.

Fig 8: Buzzer

3.1.29 Push Buttons:

A push button is a mechanical switch that is activated by pressing it. When you press the button, it completes an electrical circuit, allowing current to flow and triggering a response in a connected device or system. Push buttons are commonly used in electronics, control panels, and user interfaces to initiate actions, such as turning on a device, opening a door, or sending a signal. They come in various shapes, sizes, and designs to suit different applications.

Fig 9: Push Buttons

3.1.30 Switch:

A switch is an electrical component that controls the flow of electric current in a circuit. It can be used to turn a circuit on or off, divert current between different pathways, or control the operation of various devices. Switches come in various types, such as toggle switches, rocker switches, rotary switches, and push-button switches, each serving specific purposes based on their design and functionality. They play a crucial role in controlling the operation of electronic devices, appliances, and systems.

Fig 10: Switch

3.2 SOFTWARE REQUIREMENTS

3.2.1 Arduino IDE (Integrated Development Environment)

The Arduino IDE is a software platform that serves as the primary tool for developing, writing, and uploading code to Arduino microcontrollers. It offers an intuitive interface where users can write, edit, compile, and upload programs (sketches) to their Arduino boards. The IDE supports the Arduino programming language, which is based on Wiring and simplified C/C++, making it accessible for both beginners and experienced programmers. Through the IDE, users can select the appropriate Arduino board, configure settings, manage libraries, and monitor the serial communication between the board and the computer. It acts as a crucial bridge between hardware and software, facilitating the seamless interaction of components and enabling the execution of various functionalities in Arduino projects.

Fig 11: Arduino IDE

3.2.2 MESSAGING APP

A messaging app is a software application designed to enable real-time communication between users through text, multimedia, and sometimes voice and video. Many of which have now developed into broad platforms enabling status updates, chat bots, payments and conversational commerce (e-commerce via chat).

Fig 12: MESSAGING APP

3.3 FUNCTIONAL SPECIFICATIONS:

3.3.1 Real-time Updates:

- The trolley should update the user's shopping list and total cost in real-time as items are added or removed.

3.3.2 Automated Billing:

- The system should calculate the total cost of items in the trolley.
- Users should be able to review the bill before making payment.

3.3.3 Payment Options:

- Provide various payment options, including credit/debit card, mobile payment, or cash.
- Support for contactless payments like QR code scanning.

3.3.4 Receipt Generation:

- Generate digital receipts that can be emailed or sent to the user's mobile app

Optionally, provide a printed receipt if required.

3.3.5 Customer Support:

- Include a support feature for users to contact customer service or report issues.

3.3.6 Battery Management:

- Ensure the trolley has a reliable and rechargeable power source.

3.3.7 User-Friendly Interface:

- Design an intuitive and easy-to-use interface for both the trolley display and the accompanying mobile app.

CHAPTER 4

SYSTEM DESIGN OF "SMART SHOPPING TROLLEY WITH AUTOMATED BILLING SYSTEM"

4.1.1 Block Diagram for EV Installation

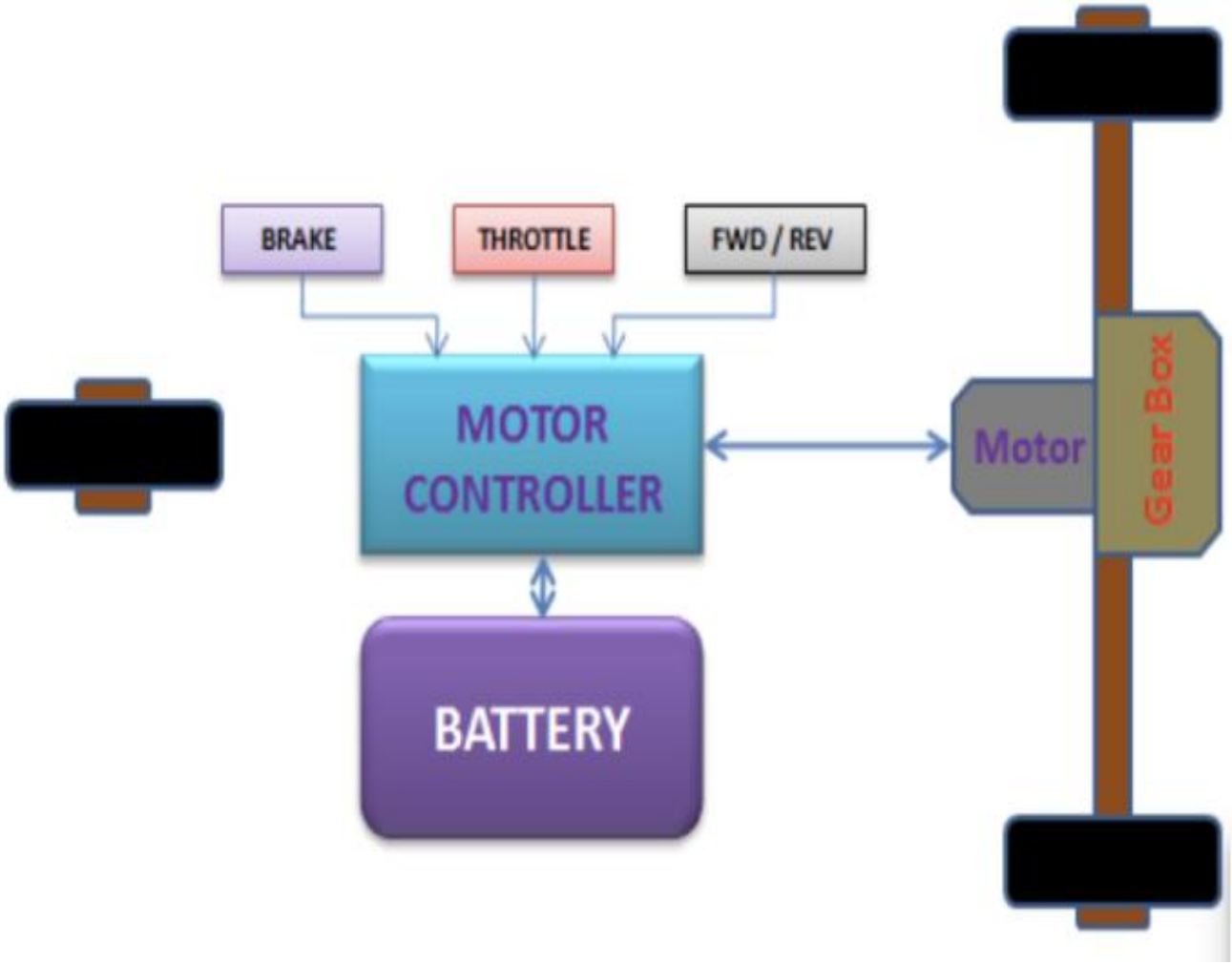


Fig 13: Block Diagram for EV Installation

4.1.2 Block Diagram for Billing System

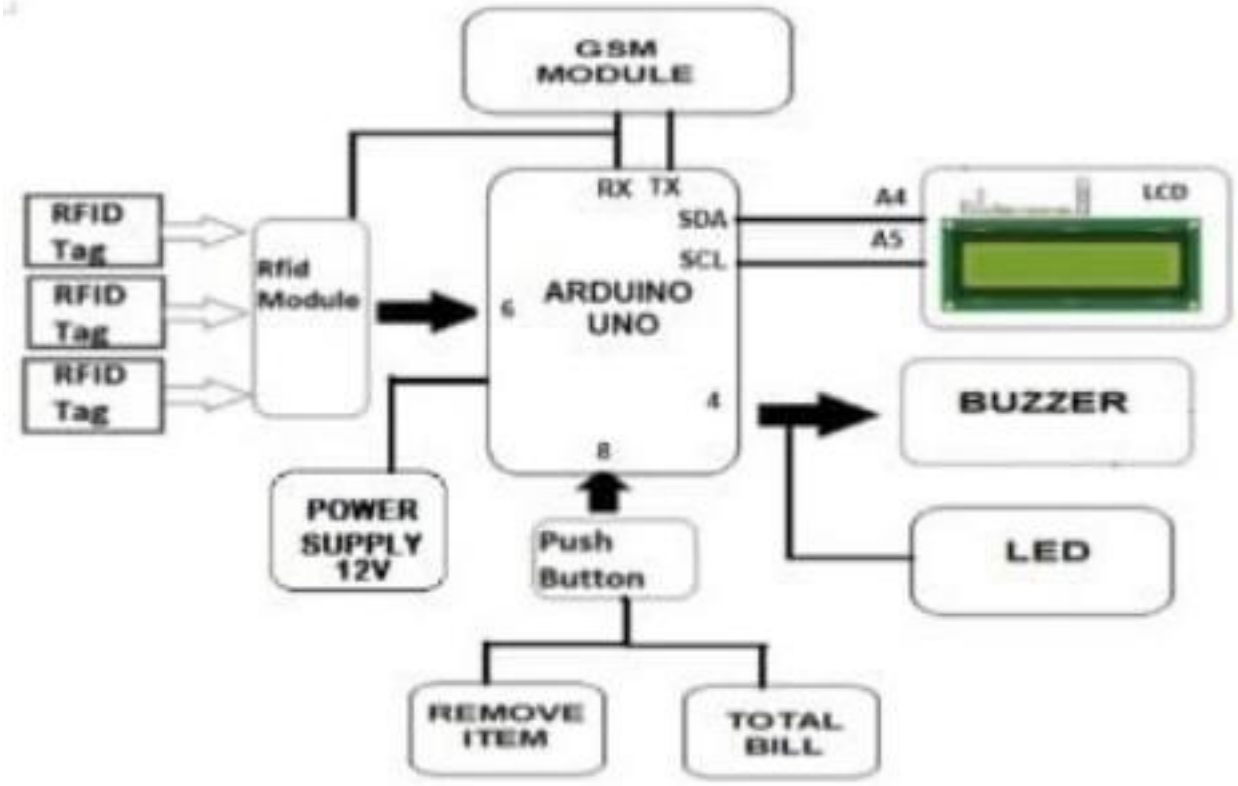


Fig 14: Block Diagram for Billing System

4.2 Coding Algorithm

Initialization:

- Set up the Arduino Uno and connect the GSM module and EM 18 RFID reader module.
- Initialize variables for storing item details, quantities, and prices.
- Initialize communication with the GSM module for sending SMS notifications.

RFID Tag Detection:

- Continuously read data from the EM 18 RFID reader module.
- When a RFID tag is detected, retrieve the tag ID and look up the corresponding item details (name, price, etc.) from a predefined database.

Adding Items to Cart:

- Update the shopping cart with the detected item's details and quantity.
- Display the added item on a display (e.g., LCD screen) for user confirmation.

Continuously Monitoring:

- Continue detecting RFID tags until the user indicates they have finished shopping.

Calculating Total:

- Sum up the prices of all items in the cart to calculate the total bill.

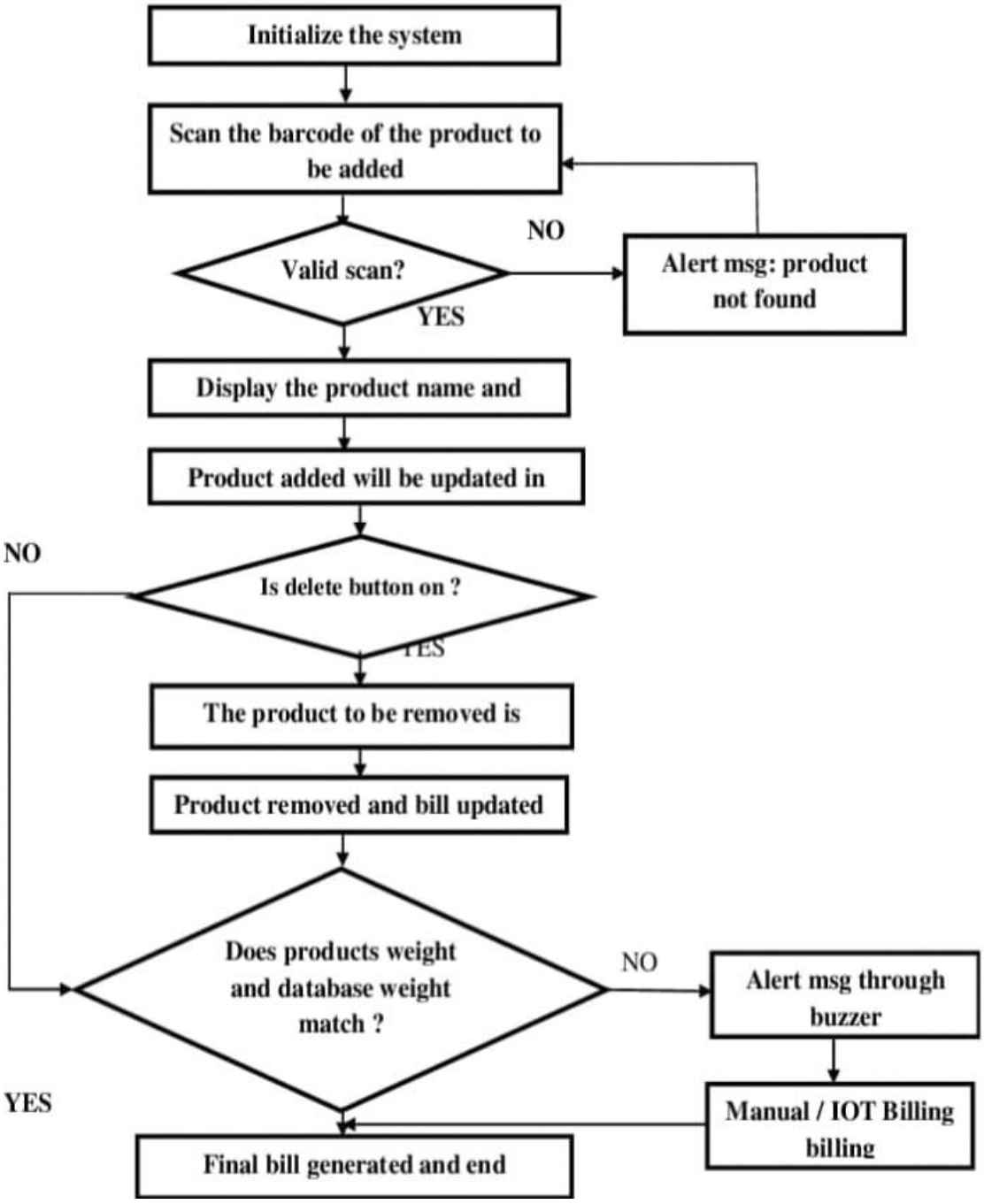
Sending SMS Notification:

- Once the user confirms they are done shopping, use the GSM module to send an SMS notification containing the total bill to a designated number.

Display and Reset:

- Display the total bill on the LCD screen.
- Clear the shopping cart and reset variables for the next shopping session.

4.2 Coding Algorithm(Flow Chart)



4.3 Implementation

1. Hardware Components:

- Smart Shopping Trolley: Equip shopping carts with RFID scanners, weight sensors, and a touchscreen interface for users to interact with.
- Automated Billing System: Install cameras and sensors in the store to track items added to the cart and automatically calculate the bill.
- EV Charging Station: Set up charging stations with the necessary connectors, RFID readers, and payment processing hardware.

2. Software Development:

- Smart Trolley Software: Develop software to process RFID scans, track items in the cart, and display the total bill on the touchscreen.
- Billing Software: Create software to link with the cart's sensors and cameras to calculate the bill in real-time. It should also manage payments and generate receipts.
- EV Charging Software: Develop software for the charging station to manage user authentication, charging sessions, and billing for EV charging.

3. Integration:

- Integrate the Smart Trolley software with the Automated Billing system to ensure that items added to the cart are accurately reflected in the bill.
- Integrate the EV Charging software with the billing system to allow seamless payment for EV charging along with the shopping bill.

4. User Authentication:

- Implement user authentication methods, such as RFID cards or mobile apps, to identify shoppers and link their carts with their accounts.

5. Payment Processing:

- Integrate payment gateways to handle transactions for both the shopping bill and EV charging fees securely.

6. Security Measures:

- Implement robust security protocols to protect user data, transaction information, and prevent theft or tampering with the trolley's system.

7. Testing and Quality Assurance:

- Thoroughly test the entire system to ensure accurate billing, user-friendly interfaces, and reliable EV charging.

8. Maintenance and Support:

- Set up a maintenance plan to ensure the ongoing functionality of the system, including regular updates and troubleshooting support.

9. Compliance and Regulations:

- Ensure that the system complies with local regulations regarding EV charging, data privacy, and retail operations.

10. User Education:

- Train store employees and educate customers on how to use the Smart Shopping Trolley and EV charging station effectively.

11. Monitoring and Analytics:

- Implement monitoring tools to gather data on shopping patterns, EV charging usage, and system performance for continuous improvement.

12. Scaling and Expansion:

- Plan for scalability, and consider expanding the system to more stores if successful.

4.4 OUTLOOK OF THE PROJECT

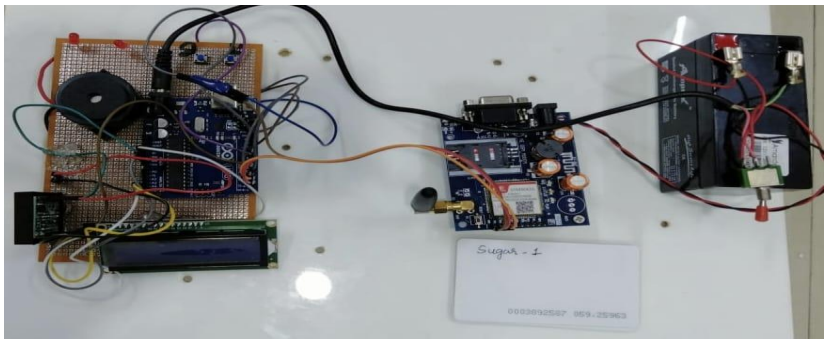


Fig 15: Billing system

Fig 16: Trolley

4.5 RESULTS

As the shopper goes on adding products, all products are detected by the module and therefore the price will increase accordingly. In case if customer changes his/her mind and doesn't want any product added in the trolley he/she can remove it and the price added will be deducted automatically.

A smart shopping trolley with automated billing and electric vehicle (EV) charging capabilities is a technologically advanced solution designed to enhance the shopping experience and support EV users.

Automated Billing System: The smart trolley is equipped with sensors and RFID technology to identify products added to the cart. As items are placed in the cart, they are automatically scanned and added to a virtual shopping list.

Real-time Price Updates: The trolley displays the current prices and discounts for scanned items on a built-in screen. Shoppers can keep track of their spending as they shop, making it easier to stay within budget.

Checkout Convenience: When shoppers are done, they can simply push the trolley to a designated checkout area. The trolley calculates the total cost and offers multiple payment options, including contactless payment methods.

EV Charging Station: Integrated charging ports allow EV owners to charge their vehicles while shopping. This provides a convenient opportunity for shoppers to top up their EVs, promoting sustainable transportation.

Navigation Assistance: The trolley can provide a store map and guide shoppers to the exact locations of items on their list. This feature saves time and reduces the frustration of searching for products.

Inventory Management: The system keeps track of inventory levels in real-time, helping stores restock efficiently. It can send alerts to store staff when items are running low.

Personalized Offers: The trolley can suggest personalized discounts and promotions based on a shopper's buying history and preferences. This enhances the shopping experience and encourages loyalty.

Security and Anti-Theft: RFID tags and security measures prevent theft and unauthorized item removal. Alerts can be sent to store security if suspicious activity is detected.

Data Analytics: The system collects valuable shopping data, which can be used to improve store layouts, product placement, and marketing strategies. It helps stores make data-driven decisions to optimize operations.

Environmental Impact: By encouraging EV charging, the trolley contributes to reducing greenhouse gas emissions. Paperless receipts and reduced food waste (due to real-time tracking) .

In summary, a smart shopping trolley with automated billing and EV charging integration offers a seamless, efficient, and environmentally friendly shopping experience. It combines technology, convenience, and sustainability to meet the evolving needs of modern shoppers and support the transition to electric transportation.

Chapter 5 CONCLUSION

In conclusion, the introduction of the smart shopping trolley with automated billing and EV installation presents a transformative shift in the retail and transportation industries. This innovation seamlessly combines convenience, efficiency, and sustainability, offering numerous benefits to both retailers and consumers. Firstly, the automated billing system integrated into the shopping trolley streamlines the shopping experience. Customers no longer need to wait in long checkout lines, scan items individually, or manually input payment information. Instead, they can simply place items in their cart, and the trolley's technology automatically keeps track of their purchases. This not only saves time but also reduces the potential for errors in billing, enhancing overall customer satisfaction. Furthermore, the incorporation of EV (Electric Vehicle) charging capabilities into the shopping trolley aligns with the growing emphasis on sustainability and eco-consciousness. Shoppers who own electric vehicles can conveniently charge their cars while shopping, promoting the use of cleaner transportation options. This can contribute to a reduction in greenhouse gas emissions and aligns with global efforts to combat climate change. Retailers also stand to benefit significantly from this innovation. Automated billing reduces the need for multiple cashier lanes and minimizes the risk of theft or shoplifting, improving operational efficiency and security. Additionally, offering EV charging facilities can attract environmentally conscious customers and serve as a competitive advantage for retailers. In summary, the smart shopping trolley with automated billing and EV installation represents a win-win solution for retailers and consumers alike. It offers a more efficient and enjoyable shopping experience while promoting sustainability and supporting the transition to cleaner transportation options. As technology continues to evolve, this innovation holds promise for reshaping the future of retail and transportation.

APPLICATIONS & FUTURE SCOPE

APPLICATIONS:

- **Retail Transactions:** Smart billing systems streamline the payment process at retail stores within the mall. They enable quick and convenient payments through various methods, such as contactless payments, mobile wallets, and digital receipts.
- **Queue Management:** In busy times, smart billing can help manage queues by enabling mobile payments, reducing wait times, and improving customer satisfaction.
- **Security and Fraud Prevention:** Smart billing systems offer security features like encrypted transactions and fraud detection mechanisms, ensuring the safety of both customers and businesses.
- **Mall Memberships:** If the mall offers membership programs with special discounts or benefits, a smart billing system can manage membership fees and provide personalized offers to members.
- **Tenant Billing:** For retailers and businesses leasing space in the mall, smart billing systems can manage rental payments, common area maintenance charges, and other associated fees.

FUTURE SCOPE:

- **Enhanced Shopping Experience:** Smart shopping trolleys can provide personalized recommendations, product information, and navigation assistance within the store. This can enhance the overall shopping experience for customers.
- **Efficient Checkout:** Automated billing and payment processing can significantly reduce checkout times and queues, making shopping more convenient for customers and improving operational efficiency for retailers.
- **Inventory Management:** These trolleys can track inventory levels in real-time, helping retailers restock shelves more efficiently and reduce out-of-stock situations.
- **Data Analytics:** The data collected from smart trolleys can be analyzed to gain insights into customer behavior, preferences, and shopping trends. Retailers can use this information for targeted marketing and inventory management.

- **Integration with Mobile Apps:** Seamless integration with mobile apps can allow customers to create shopping lists, receive promotions, and access loyalty programs, enhancing customer engagement.
- **Environmental Benefits:** EV installation on trolleys can contribute to sustainability efforts by reducing carbon emissions associated with traditional gasoline-powered vehicles for restocking shelves.
- **Retailer Efficiency:** Retailers can optimize their operations by using smart trolleys to automate tasks like restocking, price tagging, and store layout adjustments.
- **AI and Machine Learning:** Continued advancements in AI and machine learning can enable smart trolleys to provide more accurate product recommendations and personalized offers to shoppers.
- **Security and Privacy:** As these trolleys collect a significant amount of data, ensuring robust security and privacy measures will be crucial to gaining and maintaining customer trust.
- **Market Expansion:** The adoption of smart shopping trolleys may extend beyond traditional grocery stores to other retail segments such as electronics, clothing, and home improvement.
- **Global Adoption:** The concept of smart shopping trolleys may spread to markets around the world, offering opportunities for companies to expand internationally.
- **Regulatory Considerations:** As with any technology that handles customer data and integrates with payment systems, compliance with data protection and financial regulations will be essential.

REFERENCES

- Shridhar Mathad,"Smart Trolley with Automated Billing Systems Using Arduino", February 2022 IAES(International Journal of Artifical Intelligence).
- Al Sult Al Kharusi , Dinesh Keloth kaithari, Muhammad Mumtaz Mirza , Parimal S. Bhambare, "Electrically Operated Multipurpose Trolley", June 2018 IOP Conference Series Materials Science and Engineering.
- Pavni Swaroop , Akshita Parasari , Mansi Singh, Shobha Rajput, " Smart Trolley with Automated billing Systems Using Arduino", August 2022 International Journal Of Creative Research Thoughts (IJCRT).
- Snehal Kulkarni , Dr. Supriya Shanbhag," Smart Shopping Cart System", December 2022 (IJARSCT).
- Rajini.H , Sandeep Jaiswal , Shyam Sunder Prasad , Kushboo , Anjela Kadiem," Development of Automatic Shopping Trolley in Supermarkets", November2022 (IJAER)
- **https://how2electronics.com/smart-shopping-cart-with-automatic-billing-system-using-rfid-arduino/** (Smart Shopping cart)
- **https://circuitdigest.com/microcontroller-projects/smart-shopping-cart-with-automatic-billing-system-using-raspberry-pi**
- **https://youtu.be/2klCHdtFDg8** (design process of Multipurpose Trolley)

APPENDICES

EM18 RFID Module

EM-18 RFID Reader

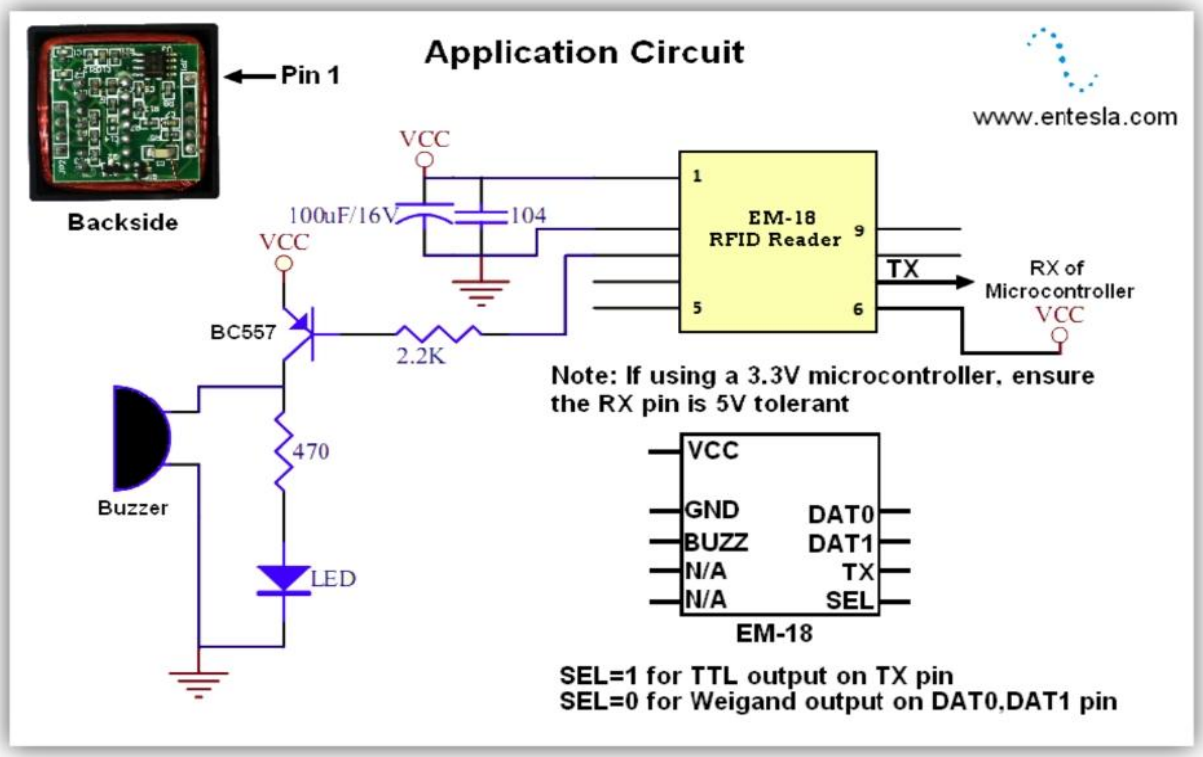
The EM-18 RFID Reader module operating at 125kHz is an inexpensive solution for your RFID based application. The Reader module comes with an on-chip antenna and can be powered up with a 5V power supply. Power-up the module and connect the transmit pin of the module to recieve pin of your microcontroller. Show your card within the reading distance and the card number is thrown at the output. Optionally the module can be configured for also a weigand output.

Typical Applications

- e-Payment
- e-Toll Road Pricing
- e-Ticketing for Events
- e-Ticketing for Public Transport
- Access Control
- PC Access
- Authentication
- Printer / Production Equipment

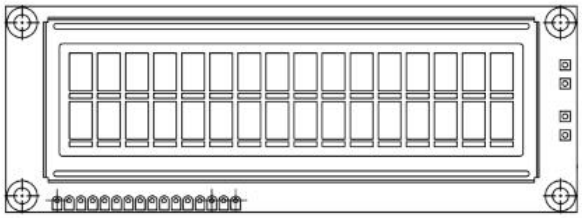
Features

RF Transmit Frequency	125kHz
Supported Standards	EM4001 64-bit RFID tag compatible
Communications Interface	TTL Serial Interface, Wiegand output
Communications Protocol	Specific ASCII
Communications Parameter	9600 bps, 8, N, 1
Power Supply	4.6V - 5.5VDC ± 10% regulated
Current Consumption	50 mA < 10mA at power down mode.
Reading distance	Up to 100mm, depending on tag
Antenna	Integrated
Size (LxWxH)	32 x 32 x 8mm



LCD Display

16 x 2 Character LCD



FEATURES

- Type: Character
- Display format: 16 x 2 characters
- Built-in controller: ST 7066 (or equivalent)
- Duty cycle: 1/16
- 5 x 8 dots includes cursor
- + 5 V power supply (also available for + 3 V)
- LED can be driven by pin 1, pin 2, pin 15, pin 16 or A and K
- N.V. optional for + 3 V power supply
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912

Pb-free RoHS COMPLIANT

MECHANICAL DATA

ITEM	STANDARD VALUE	UNIT
Module Dimension	122.0 x 44.0	mm
Viewing Area	99.0 x 24.0	
Dot Size	0.92 x 1.10	
Dot Pitch	0.98 x 1.16	
Mounting Hole	115.0 x 37.0	
Character Size	4.84 x 9.66	

ABSOLUTE MAXIMUM RATINGS

ITEM	SYMBOL	STANDARD VALUE			UNIT
		MIN.	TYP.	MAX.	
Power Supply	V_{DD} to V_{SS}	- 0.3	-	7.0	V
Input Voltage	V_I	- 0.3	-	V_{DD}	

Note

- V_{SS} = 0 V, V_{DD} = 5.0 V

ELECTRICAL CHARACTERISTICS

ITEM	SYMBOL	CONDITION	STANDARD VALUE			UNIT
			MIN.	TYP.	MAX.	
Input Voltage	V_{DD}	V_{DD} = + 5 V	4.7	5.0	5.3	V
Supply Current	I_{DD}	V_{DD} = + 5 V	-	1.6	1.5	mA
Recommended LC Driving Voltage for Normal Temperature Version Module	V_{DD} to V_0	- 20 °C	-	-	5.2	V
		0 °C	-	-	4.5	
		25 °C	4.2	4.2	-	
		50 °C	3.8	-	-	
		70 °C	3.5	-	-	
LED Forward Voltage	V_F	25 °C	-	4.2	4.6	V
LED Forward Current - Array	I_F	25 °C	-	260	520	mA
EL Power Supply Current	I_{EL}	V_{EL} = 110 V_{AC}, 400 Hz	-	-	5.0	mA

OPTIONS

PROCESS COLOR						BACKLIGHT			
TN	STN Gray	STN Yellow	STN Blue	FSTN B&W	STN Color	None	LED	EL	CCFL
x	x	x	x	x		x	x	x	

For detailed information, please see the "Product Numbering System" document.

DISPLAY CHARACTER ADDRESS CODE

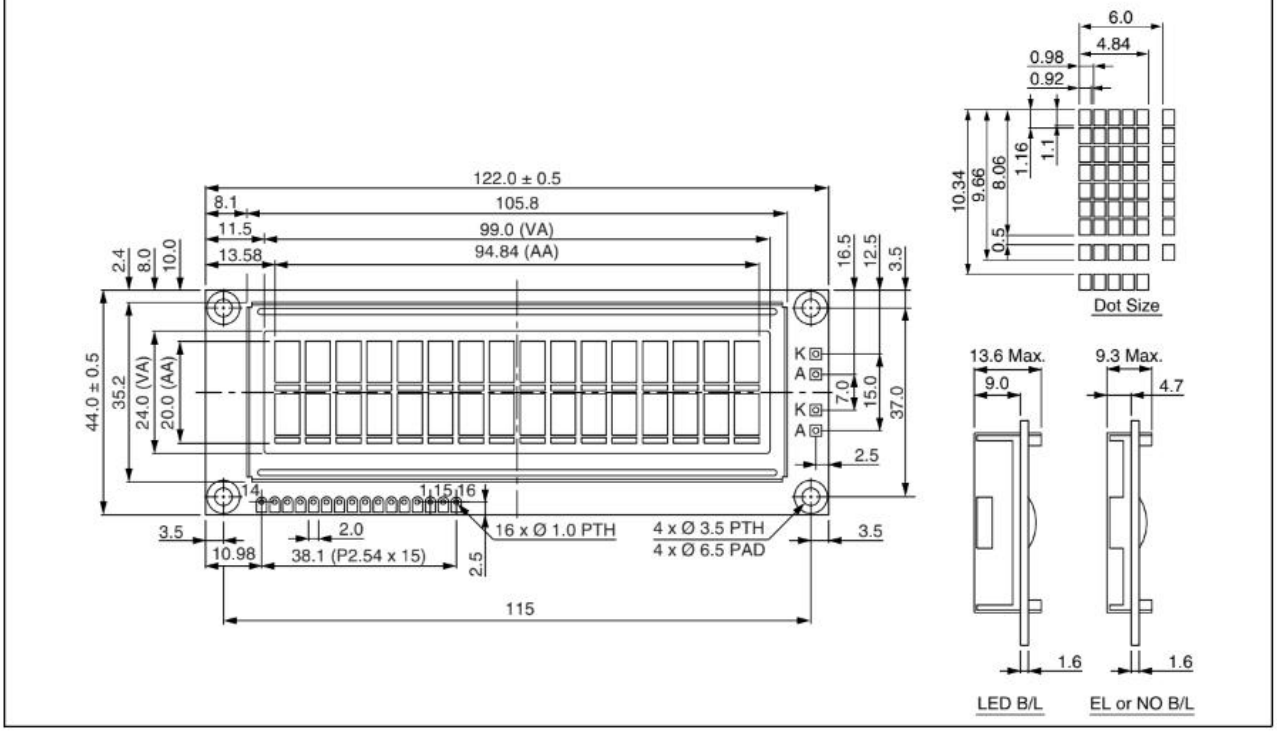
Display Position

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DD RAM Address	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
DD RAM Address	40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F

INTERFACE PIN FUNCTION

PIN NO.	SYMBOL	FUNCTION
1	V_{SS}	Ground
2	V_{DD}	+ 3 V or + 5 V
3	V_0	Contrast adjustment
4	RS	H/L register select signal
5	R/$\overline{W}$	H/L read/write signal
6	E	H → L enable signal
7	DB0	H/L data bus line
8	DB1	H/L data bus line
9	DB2	H/L data bus line
10	DB3	H/L data bus line
11	DB4	H/L data bus line
12	DB5	H/L data bus line
13	DB6	H/L data bus line
14	DB7	H/L data bus line
15	A/V_{EE}	+ 4.2 V for LED (R_A = 0 Ω)/negative voltage output
16	K	Power supply for B/L (0 V)

DIMENSIONS in millimeters



Sealed Rechargable Battery

Specification

Nominal Voltage	12V	
Nominal Capacity (20 HR)	1.3AH	
Dimensions	Length	97±1mm (3.82inches)
	Width	43±1mm (1.69inches)
	Container Height	52±1mm (2.05inches)
	Total Height (with Terminal)	58±1mm (2.28inches)
Approx Weight	Approx 0.57kg	
Terminal	T1	
Container Ma terial	ABS	
Rated Cap acity	1.20 AH/0.060A	(20hr ,1.80V/cell,25 °C/77 °F)
	1.12 AH/0.112A	(10hr,1.80V/cell,25 °C/77 °F)
	1.01 AH/0.202A	(5hr,1.75V/cell,25 °C/77 °F)
	0.882 AH/0.294A	(3hr,1.75V/cell,25 °C/77 °F)
	0.728AH/0.728A	(1hr,1.60V/cell,25 °C/77 °F)
Max. Discharge C urrent	18A (5s)	
Internal Re sistance	Approx 90m Ù	
Ope rating Temp.Ra nge	Discharge : -15 ~50°C (5 ~122°F)	
	Charge : 0 ~40°C (32 ~104°F)	
	Storage : -15 ~40°C (5 ~104°F)	
Nominal O perating Temp. R ange	25 ±3°C (77 ±5°F)	
Cycle Use	Initial C harging C urrent less than 0.36A. Voltage 14.4V~15.0V at 25°C (77°F) Temp. C oefficient -30mV/°C	
Standby Use	No limit on Initial C harging C urrent V oltage 13.5V~13.8V at 25°C (77°F) Temp. C oefficient -20mV/°C	
Capacity affected by Temperature	40°C (104°F)	103%
	25°C (77°F)	100%
	0°C (32°F)	86%
Self Discharge	Amptek ATse ries batteries may be stored for up to 6 months at 25°C(7 7°F) and then a freshe ning charge is required. For higher temperatures the time interval will be s horter.	

Applications

- All purpose
- Uninterruptable Power Supply (UPS)
- Electric Power System(EPS)
- Emergency backup power supply
- Emergency light
- Railway signal
- Aircraft signal
- Alarm and security system
- Electronic apparatus and equipment
- Communication power supply
- DC power supply
- Auto control system

VdS Intertek ETL SEMKO ISO14001 ISO9001 CE EMC

Constant Current Discharge (Amperes) at 25°C (77°F)

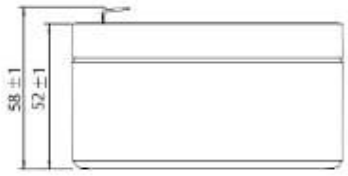
F.V/Time	5min	10min	15min	20min	30min	45min	1h	2h	3h	4h	5h	6h	8h	10h	20h
1.85V/cell	2.30	1.61	1.32	1.15	0.922	0.709	0.580	0.354	0.270	0.222	0.188	0.163	0.130	0.108	0.059
1.80V/cell	2.83	1.92	1.54	1.30	1.02	0.773	0.624	0.376	0.284	0.233	0.196	0.170	0.134	0.112	0.060
1.75V/cell	3.36	2.17	1.69	1.41	1.09	0.821	0.656	0.392	0.294	0.240	0.202	0.174	0.138	0.114	0.061
1.70V/cell	3.81	2.39	1.83	1.52	1.14	0.853	0.684	0.409	0.303	0.246	0.207	0.179	0.140	0.116	0.062
1.65V/cell	4.20	2.57	1.94	1.59	1.19	0.886	0.713	0.421	0.311	0.251	0.211	0.182	0.142	0.117	0.063
1.60V/cell	4.41	2.68	2.02	1.65	1.23	0.906	0.728	0.434	0.318	0.258	0.216	0.186	0.145	0.119	0.063

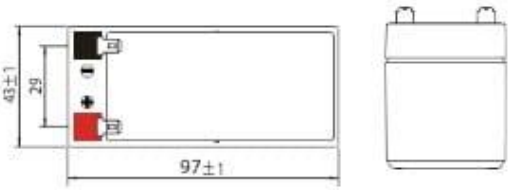
Constant Power Discharge (Watts/cell) at 25°C (77°F)

F.V/Time	5min	10min	15min	20min	30min	45min	1h	2h	3h	4h	5h	6h	8h	10h	20h
1.85V/cell	4.35	3.06	2.55	2.23	1.80	1.39	1.14	0.701	0.536	0.442	0.377	0.327	0.261	0.217	0.120
1.80V/cell	5.28	3.61	2.93	2.50	1.98	1.51	1.22	0.741	0.560	0.462	0.390	0.339	0.269	0.224	0.121
1.75V/cell	6.18	4.05	3.20	2.70	2.10	1.59	1.28	0.768	0.577	0.474	0.399	0.345	0.274	0.226	0.121
1.70V/cell	6.93	4.42	3.43	2.88	2.19	1.64	1.33	0.796	0.592	0.483	0.406	0.352	0.277	0.229	0.122
1.65V/cell	7.54	4.69	3.59	2.99	2.26	1.70	1.37	0.814	0.604	0.490	0.413	0.357	0.280	0.231	0.124
1.60V/cell	7.79	4.82	3.70	3.05	2.30	1.72	1.39	0.834	0.615	0.499	0.419	0.362	0.284	0.234	0.124

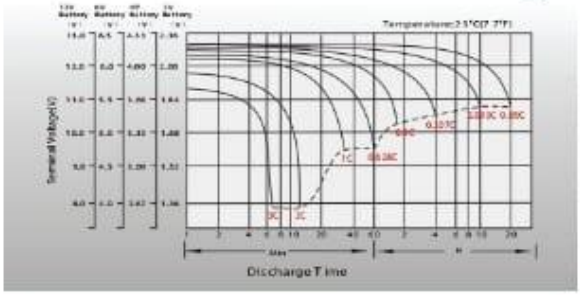
Dimensions

T1 Terminal
Unit: mm [inches]

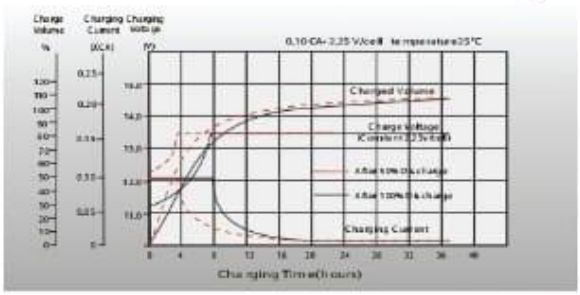




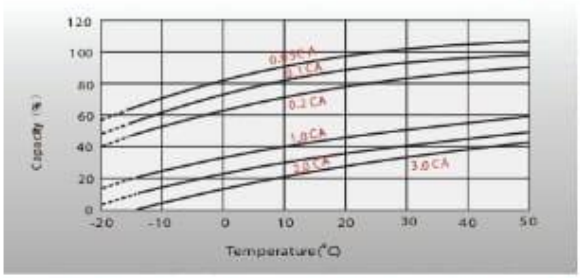
Discharge Characteristics



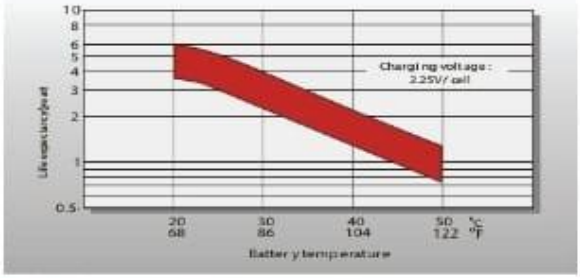
Float Charging Characteristics



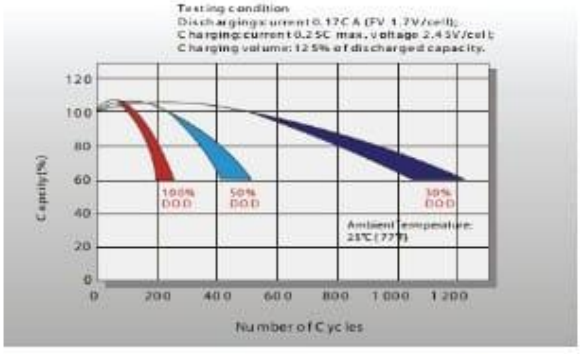
Temperature Effects in Relation to Battery Capacity



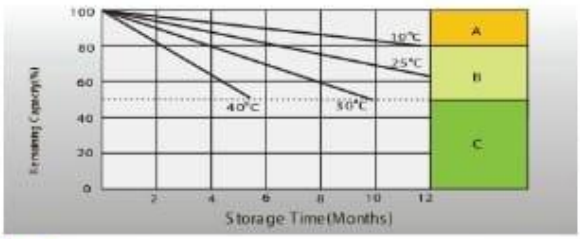
Effect of Temperature on Long Term Float Life



Cycle Life in Relation to Depth of Discharge



Self Discharge Characteristics



A — No supplementary charge required.
(Carry out supplement charge before use if 100% capacity is required.)

B — Supplementary charge required before use, optional charging way as below:
1. Charged for above 3 days at limited current 0.25CA and constant voltage 2.25V/cell
2. Charged for above 20 hours at limited current 0.25CA and constant voltage 2.4V/Cell
3. Charged for 8-10 hours at limited current 0.05CA.

C — Supplementary Charge may often fail to recover the capacity.
The battery should never be left standing till this is reached.

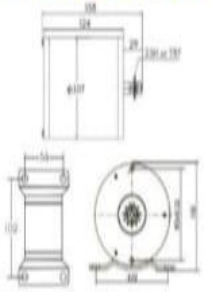
BLDC1109 Motor

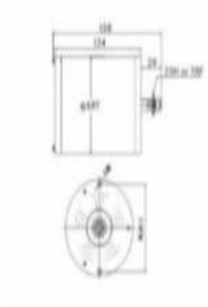
The power and model can optional have:

500W/36V;500W/48V;800W/36V;1000W/36V;1000W/48V;1200W/48V;1500W/48V;1600W/48V;1800W/48V;1800W/60V;2000W/48V;2000W/60V;2500W/60V;2500W/72V;3000W 60V;3000W/72V

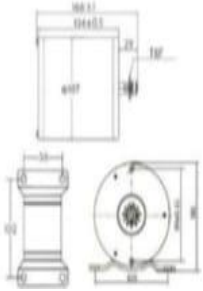
Model/规格型号	BM1109							
Specification 功率/电压	800W 36V	1000W 36V/48V	1200W 48V	1500W 48V	1600W 48V	1800W 48V	2000W 60V	3000W 72V
Unload current 空载电流/A	≤4.5	≤4.8/4.2	≤5.6	≤8.5	≤8.8	≤7.6	≤7.2	≤8.8
Unloaded speed 空载转速 /rpm	3500	3500	4200	5000	5000	5200	5400	5800
Rated torque 额定扭矩/N·m	2.2	2.7	3	3.75	4	4.5	5	5.4
Rated speed 额定转速/rpm	3100	3100	3500	3750	3900	4500	4600	4900
Rated current 额定电流/A	≤23	≤28/21	≤26	≤30	≤34	≤38	≤36	≤43
Efficiency 电机效率/%	≥80	≥80	≥80	≥80	≥80	≥80	≥80	≥80
Application 应用范围	Scooter/Small Electric motorcycle 滑板车 / 电摩							

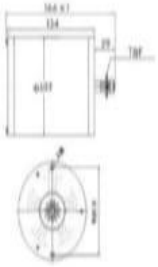
500W/800W/1000W /1200W/1500W SIZE:





1600W/1800W/2000W/3000W SIZE:





Lithium ion battery

1. Scope

This specification describes the technological parameters and testing standard for the lithium ion rechargeable cell manufactured and supplied by EEMB Co. Ltd.

2. Products specified

2.1 Name Cylindrical Lithium Ion Rechargeable Cell

2.2 Type LIR18650-2600mAh

3. References

In this specification reference is made to: GB/T182847-2000, UL1642 and IEC61960-1:2000.

4. Caution:

4.1. Please read these specifications carefully before testing or using the cell as improper handling of a Li-ion cell may result in lose of efficiency, heating, ignition, electrolyte leakage or even explosion.

4.2 While testing the cell by charging and discharging, please use test-equipment especially designed for Li-ion cell. Do not use ordinary constant current and constant voltage (CC/CV) power supplies. These do not protect the cell from being overcharged and over-discharged, resulting in possible loss of functionality or danger.

4.3 When charging and discharging cells or packing them into equipment, reversing the positive and negative terminals will result in overcharging and over-discharging of the cell(s). This could lead to serious loss of efficiency and even explosions.

4.4 Do not solder directly on the cell. Do not resolve the cell.

4.5 Do not put cell(s) in pockets or bags together with metal products such as necklaces, hairpins, coins, screws, etc. Neither stores them together without proper isolation. Do not connect the positive and negative electrode directly with each other through conductive materials. This can result in a short circuit of the cell.

4.6 Do not beat, throw or trample the cell, do not put the cell into washing machines or high-pressure containers.

4.7 Keep the cell away from heat sources such as fires, heaters, etc. Do not use or store cell(s) at locations where the temperature can exceed 60℃， such as in direct sunlight. This may lead to the generation of excessive heat, ignition and lose of efficiency.

4.8 Do not get cells wet or throw them into water. When not in use, place the cells in a dry environment at low temperatures.

4.9 While during use, testing or storing cells, cells become hot, distribute a smell, change color, deform or show any other abnormalities, please stop using or testing immediately. Attempt to isolate the cell and keep it away from other cells.

4.10 Should electrolyte get into the eyes, do not rub the eyes, rinse the eyes with clean water and seek medical attention if problems remain. If electrolyte gets onto the skin or clothing, wash with clean water immediately.

5. BASIC CHARACTERISTICS

5.1 Capacity（25±5℃）	Nominal Capacity：2600mAh (0.52A Discharge, 2.75V) Typical Capacity：2550mAh（0.52A Discharge, 2.75V） Minimum Capacity：2500mAh (0.52A Discharge，2.75V)
5.2 Nominal Voltage	3.7V
5.3 Internal Impedance	≤70mΩ
5.4 Discharge Cut-off Voltage	3.0V
5.5 Max Charge Voltage	4.20±0.05V
5.6 Standard Charge Current	0.52A
5.7 Rapid Charge Current	1.3A
5.8 Standard Discharge Current	0.52A
5.9 Rapid Discharge Current	1.3A
5.10 Max Pulse Discharge Current	2.6A
5.11 Weight	46.5±1g
5.12 Max. Dimension	Diameter(Ø): 18.4mm Height (H): 65.2mm
5.13 Operating Temperature	Charge: 0 ~ 45℃ Discharge: -20 ~ 60℃
5.14 Storage Temperature	During 1 month: -5 ~ 35℃ During 6 months: 0 ~ 35℃

6. Standard conditions for test

All the tests need to be done within one month after the delivery date under the following conditions :
Ambient Temperature:25±5℃; Relative Huimdity:65±20%

Standard Charge	Constant Current and Constant Voltage (CC/CV) Current = 0.52A Final charge voltage = 4.2V Final charge Current = 0.052A
Standard Discharge	Constant Current (CC) Current = 0.52A End Voltage = 3.0V

7. Appearance

All surfaces must be clean, without damages, leakage and corrosion. Each product will have a product label identifying the model.

RFID TAGS

	Texas Instruments Tag-it HF-I	NXP ICODE SLIX
Operating Frequency	13.56 MHxz	13.56 MHxz
EEPROM Size	256 byte (2048 bit)	128 byte (1024 bit)
Memory Organization	64 blocks 4 bytes per block	32 blocks 4 bytes per block
Unique Serial Number (UID)	8 byte (64 bit)	8 byte (64 bit)
RF Interface	ISO 15693-3	ISO 15693-3
Data Retention (years)	10	10
Write Endurance (cycles)	100,000	100,000
Read/Write Range	3.5" / 8.9 cm	3.5" / 8.9 cm

Code

```
#include <LiquidCrystal_I2C.h>
#include <SoftwareSerial.h>

#include <stdio.h>
#include <stdlib.h>
#include <string.h>

void SEND_SMS( char *num1, char * str1 );
void rfid1(void);
LiquidCrystal_I2C lcd(0x27,16,2);

SoftwareSerial RfidSerial(6, 7); // RX, TX
SoftwareSerial Serial1(2, 3); // RX, TX

int BILL=4;
int REMOVE=8;
int BUZZER=5;
int RFID_LED=9;

String message="";
String str;
void rfid1(void);

char total1[4];
int L=0,M=0;
int item1=25,item2=35,item3=50,item4=30,total;
int exceed;
void setup()
{
```

```
 Serial.begin(9600);
  Serial1.begin(9600);
   RfidSerial.begin(9600);
   lcd.init();
   lcd.backlight();
   pinMode(BILL,INPUT_PULLUP);
   pinMode(REMOVE,INPUT_PULLUP);
   pinMode(BUZZER,OUTPUT);
   pinMode(RFID_LED,OUTPUT);



   lcd.begin(16,2);
   lcd.clear();
   lcd.print("SMART TROLLEY");
   Serial.println("$SMART TROLLEY#");
   SEND_SMS("9113854195","WELCOME TO SHOPPING");
   delay(2000);
   digitalWrite(BUZZER,LOW);
   digitalWrite(RFID_LED,LOW);

}

void loop()
{
  if(digitalRead(BILL)==LOW)
  {
        str = String(total);
        str.toCharArray(total1,4);
        lcd.clear();
        lcd.setCursor(0,0);
        lcd.print("TOTAL BILL IS:");
        lcd.setCursor(0,1);
        lcd.print(total);
```

```
        Serial.print("$TOTAL BILL IS:");
        Serial.print(total);
        Serial.println("#");
        SEND_SMS("9113854195","TOTAL BILL IS:");
        delay(2000);
        SEND_SMS("9113854195",total1);
        delay(2000);
        SEND_SMS("9113854195","THANK FOR SHOPPING VISIT AGAIN");
         lcd.clear();
        lcd.setCursor(0,0);
        lcd.print("THANK YOU");
        lcd.setCursor(0,1);
        lcd.print("VISIT AGAIN");
        delay(2000);
        delay(2000);
        while(1);
//         if(total>200)
//         {
//           lcd.clear();
//           lcd.setCursor(0,0);
//          lcd.print("MORE BILL  ");
//
//           digitalWrite(BUZZER,HIGH);
//         delay(1000);
//           digitalWrite(BUZZER,LOW);
//
//         }
//         total=0;
//         rfid1();
//        digitalWrite(BUZZER,LOW);

   }
   if(digitalRead(REMOVE)==LOW)
```

```
  {
       lcd.clear();
        lcd.setCursor(0,0);
        lcd.print("REMOVE");
        rfid2();


   }
    rfid1();

}



void rfid1(void)
{
  lcd.clear();
  lcd.setCursor(0,0);
  lcd.print("SCAN THE PRODUCT");

  delay(1000);


  while(1)
  {
   if(digitalRead(BILL)==LOW)
     {
       str = String(total);
       str.toCharArray(total1,4);
       lcd.clear();
       lcd.setCursor(0,0);
       lcd.print("TOTAL BILL IS:");
       lcd.setCursor(0,1);
```

```
 lcd.print(total);
 Serial.print("$TOTAL BILL IS:");
 Serial.println(total);
 Serial.println("#");
 SEND_SMS("9113854195","TOTAL BILL IS:");
 delay(2000);
 SEND_SMS("9113854195",total1);
 delay(2000);
 SEND_SMS("9113854195","THANK FOR SHOPPING VISIT AGAIN");
  lcd.clear();
 lcd.setCursor(0,0);
 lcd.print("THANK YOU");
 lcd.setCursor(0,1);
 lcd.print("VISIT AGAIN");
 delay(2000);
delay(2000);
while(1);
//    if(L>M)
//     {
//       Serial.println("111111111");
//
//     }
//      if(L<M)
//     {
//       Serial.println("000000000");
//
//     }
//     if(total>200)
//     {
//       lcd.clear();
//       lcd.setCursor(0,0);
//      lcd.print("MORE BILL  ");
//       digitalWrite(BUZZER,HIGH);
```

```
//          delay(1000);
//            digitalWrite(BUZZER,LOW);
//
//          }
//          delay(5000);
//          total=0;
//          L=0;
//          M=0;
//          rfid1();


      }
       if(digitalRead(REMOVE)==LOW)
  {
       lcd.clear();
        lcd.setCursor(0,0);
        lcd.print("REMOVE");
        rfid2();


  }
  if(RfidSerial.available()>0)
   {
    message=RfidSerial.readString();
    int str_len = message.length() + 1;
    char textmessage[12];
    message.toCharArray(textmessage,str_len);
    Serial.println(textmessage);
    textmessage[12]='\0';

     if((strcmp(textmessage,"17003B656B22"))==0)
     {
       lcd.clear();
```

```
  lcd.setCursor(0,0);
  lcd.print("SUGAR ,ID:001 ");
  lcd.setCursor(0,1);
  lcd.print("AMOUNT:25Rs. ");
  total=total+item1;
  digitalWrite(RFID_LED,HIGH);
    delay(3000);
    digitalWrite(RFID_LED,LOW);
     lcd.clear();
   lcd.setCursor(0,0);
  lcd.print("BILL");
  lcd.setCursor(0,1);
  lcd.print(total);
  Serial.println("SUGAR 25Rs");
  //Serial.print(total);
  delay(5000);

  L=L+1;
  if(total>200)
  {
    lcd.clear();
    lcd.setCursor(0,0);
   lcd.print("MORE BILL  ");
    digitalWrite(BUZZER,HIGH);
  delay(10000);
    digitalWrite(BUZZER,LOW);

  }
  rfid1();
}
 if((strcmp(textmessage,"190083E1552E"))==0)
{
  lcd.clear();
```

```
  lcd.setCursor(0,0);
  lcd.print("RICE ,ID:002");
  lcd.setCursor(0,1);
  lcd.print("AMOUNT:35Rs. ");
  total=total+item2;
   digitalWrite(RFID_LED,HIGH);
    delay(3000);
    digitalWrite(RFID_LED,LOW);
   lcd.clear();
   lcd.setCursor(0,0);
  lcd.print("BILL");
  lcd.setCursor(0,1);
  lcd.print(total);
   Serial.println("RICE 35Rs.");
  delay(5000);

  M=M+1;
   if(total>200)
  {
    lcd.clear();
    lcd.setCursor(0,0);
   lcd.print("MORE BILL  ");
    digitalWrite(BUZZER,HIGH);
  delay(1000);
    digitalWrite(BUZZER,LOW);

  }

  rfid1();
}
if((strcmp(textmessage,"19006A21C290"))==0)
{
  lcd.clear();
```

```
  lcd.setCursor(0,0);
  lcd.print("OIL ,ID:003 ");
  lcd.setCursor(0,1);
  lcd.print("AMOUNT:50Rs. ");
 total=total+item3;
   digitalWrite(RFID_LED,HIGH);
    delay(3000);
    digitalWrite(RFID_LED,LOW);
  lcd.clear();
   lcd.setCursor(0,0);
  lcd.print("BILL");
  lcd.setCursor(0,1);
  lcd.print(total);
   Serial.println("OIL  50Rs. ");
  delay(5000);

   if(total>200)
   {
    lcd.clear();
    lcd.setCursor(0,0);
   lcd.print("MORE BILL  ");
    digitalWrite(BUZZER,HIGH);
    delay(1000);
    digitalWrite(BUZZER,LOW);



   }
  rfid1();
}
if((strcmp(textmessage,"19006E963EDF"))==0)
{
  lcd.clear();
  lcd.setCursor(0,0);
```

```
  lcd.print("SALT ,ID:004 ");
  lcd.setCursor(0,1);
  lcd.print("AMOUNT:30Rs. ");
 total=total+item4;
   digitalWrite(RFID_LED,HIGH);
    delay(3000);
    digitalWrite(RFID_LED,LOW);
  lcd.clear();
   lcd.setCursor(0,0);
  lcd.print("BILL");
  lcd.setCursor(0,1);
  lcd.print(total);
   Serial.println("SALT  30Rs. ");
  delay(5000);

   if(total>200)
   {
    lcd.clear();
    lcd.setCursor(0,0);
   lcd.print("MORE BILL  ");
    digitalWrite(BUZZER,HIGH);
    delay(1000);
    digitalWrite(BUZZER,LOW);



  }
  rfid1();
}

 if((strcmp(textmessage,"170073BB7AA5"))==0)
{
  lcd.clear();
  lcd.setCursor(0,0);
```

```
  lcd.print("CURRENTLY ");
  lcd.setCursor(0,1);
  lcd.print("UNAVAILABLE ");
  Serial.println("CURRENTLY UNAVAILABLE");
 total=total;
  digitalWrite(RFID_LED,HIGH);
    delay(3000);
    digitalWrite(RFID_LED,LOW);
  lcd.clear();
   lcd.setCursor(0,0);
  lcd.print("BILL");
  lcd.setCursor(0,1);
  lcd.print(total);
//    Serial.println("OIL  50Rs. ");
  delay(5000);

//      if(total>200)
//      {
//       lcd.clear();
//       lcd.setCursor(0,0);
//      lcd.print("MORE BILL  ");
//       digitalWrite(BUZZER,HIGH);
//       delay(1000);
//       digitalWrite(BUZZER,LOW);
//
//
//      }
  rfid1();
}


if(digitalRead(BILL)==LOW)
{
```

```
str = String(total);
str.toCharArray(total1,4);
lcd.clear();
lcd.setCursor(0,0);
lcd.print("TOTAL BILL IS:");
lcd.setCursor(0,1);
lcd.print(total);
Serial.print("$TOTAL BILL IS:");
Serial.println(total);
Serial.println("#");
SEND_SMS("9113854195","TOTAL BILL IS:");
delay(2000);
SEND_SMS("9113854195",total1);
delay(2000);
SEND_SMS("9113854195","THANK FOR SHOPPING VISIT AGAIN");
 lcd.clear();
lcd.setCursor(0,0);
lcd.print("THANK YOU");
lcd.setCursor(0,1);
lcd.print("VISIT AGAIN");
delay(2000);
delay(2000);
while(1);
//        if(L>M)
//        {
//          Serial.println("111111111");
//
//        }
//        if(L<M)
//        {
//          Serial.println("000000000");
//
//        }
```

```
//          if(total>200)
//          {
//           lcd.clear();
//           lcd.setCursor(0,0);
//           lcd.print("MORE BILL  ");
//           digitalWrite(BUZZER,HIGH);
//           delay(1000);
//           digitalWrite(BUZZER,LOW);
//
//
//          }
//          total=0;
//          rfid1();
//
//
      }
     if(digitalRead(REMOVE)==LOW)
     {
        lcd.clear();
        lcd.setCursor(0,0);
        lcd.print("REMOVE");
        rfid2();
     }


   }
  }
}
void rfid2(void)
{
  lcd.clear();
  lcd.setCursor(0,0);
  lcd.print("SCAN THE PRODUCT");
```

```
//  digitalWrite(Voice1,LOW);
  delay(1000);
//  digitalWrite(Voice1,HIGH);
   while(1)
   {
    if(digitalRead(BILL)==LOW)
       {
        str = String(total);
         str.toCharArray(total1,4);
        lcd.clear();
         lcd.setCursor(0,0);
         lcd.print("TOTAL BILL IS:");
         lcd.setCursor(0,1);
         lcd.print(total);
         Serial.print("$TOTAL BILL IS:");
         Serial.println(total);
         Serial.println("#");
         SEND_SMS("9113854195","TOTAL BILL IS:");
         delay(2000);
         SEND_SMS("9113854195",total1);
         delay(2000);
         SEND_SMS("9113854195","THANK FOR SHOPPING VISIT AGAIN");
          lcd.clear();
         lcd.setCursor(0,0);
         lcd.print("THANK YOU");
         lcd.setCursor(0,1);
         lcd.print("VISIT AGAIN");
         delay(2000);
         delay(2000);
         while(1);
//          if(L>M)
//         {
//           Serial.println("111111111");
```

```
//
//          }
//           if(L<M)
//          {
//            Serial.println("000000000");
//
//          }
//          total=0;
//          rfid1();



      }
    if(RfidSerial.available()>0)
    {
     message=RfidSerial.readString();
    int str_len = message.length() + 1;
    char textmessage[12];
    message.toCharArray(textmessage,str_len);
    Serial.println(textmessage);
    textmessage[12]='\0';
    delay(1000);

    if((strcmp(textmessage,"17003B656B22"))==0)
     {
       lcd.clear();
       lcd.setCursor(0,0);
       lcd.print("SUGAR ,ID:001 ");
       lcd.setCursor(0,1);
       lcd.print("REMOVED 25Rs ");
       total=total-item1;
       digitalWrite(RFID_LED,HIGH);
       delay(3000);
       digitalWrite(RFID_LED,LOW);
```

```
  lcd.clear();
  lcd.setCursor(0,0);
  lcd.print("BILL");
  lcd.setCursor(0,1);
  lcd.print(total);
 // Serial.println("SUGAR -25Rs");
  //Serial.print(total);
  delay(5000);
  L=L-1;

  rfid1();
}
if((strcmp(textmessage,"190083E1552E"))==0)
{
  lcd.clear();
  lcd.setCursor(0,0);
  lcd.print("RICE ,ID:002");
  lcd.setCursor(0,1);
  lcd.print("REMOVED 35Rs. ");
  total=total-item2;
  digitalWrite(RFID_LED,HIGH);
    delay(3000);
    digitalWrite(RFID_LED,LOW);
   lcd.clear();
   lcd.setCursor(0,0);
  lcd.print("BILL");
  lcd.setCursor(0,1);
  lcd.print(total);
 //  Serial.println("RICE 35Rs.");
  delay(5000);
  M=M-1;

  rfid1();
```

```
}
 if((strcmp(textmessage,"19006A21C290"))==0)
{
  lcd.clear();
  lcd.setCursor(0,0);
  lcd.print("OIL ,ID:003 ");
  lcd.setCursor(0,1);
  lcd.print("REMOVED 50Rs. ");
total=total-item3;
   digitalWrite(RFID_LED,HIGH);
    delay(3000);
    digitalWrite(RFID_LED,LOW);
  lcd.clear();
   lcd.setCursor(0,0);
  lcd.print("BILL");
  lcd.setCursor(0,1);
  lcd.print(total);
 //  Serial.println("OIL  50Rs. ");
  delay(5000);

  rfid1();
}
 if((strcmp(textmessage,"19006E963EDF"))==0)
{
  lcd.clear();
  lcd.setCursor(0,0);
  lcd.print("SALT ,ID:004 ");
  lcd.setCursor(0,1);
  lcd.print("REMOVED 30Rs. ");
total=total-item4;
   digitalWrite(RFID_LED,HIGH);
    delay(3000);
    digitalWrite(RFID_LED,LOW);
```

```
  lcd.clear();
   lcd.setCursor(0,0);
  lcd.print("BILL");
  lcd.setCursor(0,1);
  lcd.print(total);
 //  Serial.println("OIL  50Rs. ");
  delay(5000);


  rfid1();
}
if(digitalRead(BILL)==LOW)
{
  str =String(total);
  str.toCharArray(total1,4);
 lcd.clear();
  lcd.setCursor(0,0);
  lcd.print("TOTAL BILL IS:");
  lcd.setCursor(0,1);
  lcd.print(total);
  Serial.print("$TOTAL BILL IS:");
  Serial.println(total);
  Serial.println("#");
  SEND_SMS("9113854195","TOTAL BILL IS:");
  delay(2000);
  SEND_SMS("9113854195",total1);
  delay(2000);
  SEND_SMS("9113854195","THANK FOR SHOPPING VISIT AGAIN");
  lcd.clear();
  lcd.setCursor(0,0);
  lcd.print("THANK YOU");
  lcd.setCursor(0,1);
  lcd.print("VISIT AGAIN");
  delay(2000);
```

```
        while(1);
//          if(L>M)
//          {
//            Serial.println("111111111");
//
//          }
//          if(L<M)
//          {
//            Serial.println("000000000");
//
//          }
//          total=0;
//          rfid1();



      }
    }
  }
}
   void SEND_SMS( char *num1, char * str1 )
{
  char buff[10],i=0;
//while(i<3)
//{
  Serial1.write('A');
  delay(100);
  Serial1.write('T');
  delay(100);
  Serial1.write('E');
  delay(100);
  Serial1.write('0');
  delay(100);
  Serial1.write('\r');
```

```
//i++;
 // recvResponse(buff);
 //Serial.print("AT sent");
  //*****
  Serial1.write("AT+CMGF=1\r"); //Initialize GSM For mobile
   delay(2000);
   //Serial.print("cmgf sent");
 //  sendSMS("9071295134","hiiiii");
//  recvResponse(buff);
delay(2000);
//Serial.print("ATcmgf sent");
Serial1.write("AT+CMGS=\"");
 delay(2000);
 Serial1.write(num1);
 delay(2000);
 Serial1.write("\"\r");
 // gsmSerial.write("AT+CNMI=0,0,0,0\r"); //Disabling unsolicited sms indication.
//  recvResponse(buff);
  //recvResponse(buff);
Serial1.write(str1);
 delay(2000);
Serial1.write(26);
 delay(2000);
 Serial.print("sms sent");
//}
}
```