

Automatic Rationing for Public Distribution System (PDS) using RFID and GSM Module to Prevent Irregularities

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Abstract

Public distribution system i.e rationing distribution is one of the widely controversial issue that involves corruption and illegal smuggling of goods. One reason of this to happen is because every job in the ration shop involves manual work and there is no specific technology involved in automating the job. Involvement of manual work calls a lots of irregularities. These irregularities or illegal activities are for example - wrong entries in stock register of shop containing wrong stock information of the products that is

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supplied to the public, sometimes there are chance of distribution of low quality/graded products than the actual products provided by the Government for supplying to the public, also the information regarding the actual available stock quantity in a ration shop that is provided by the Government to the public. In this paper we propose the concept of replacing manual work/job in public distribution system (rationing distribution system in India) by automated system which can be installed at the ration shop with ease. In this automated system we replace the conventional ration card by smart card in which all the details about users are provided including their *AADHAR* (social security) number which is used for user authentication. This prompted us to interface smart card reader (RFID Based) to the microcontroller (AT89C51) and PC via RS232 to develop such a system. Using such a sytem, Government would have all required control/monitoring over the transactions at ration shop. To involve Government in the process we proposed connecting the system at ration shop to a central database (provided by Govt.) via GSM module (SIM900D) and RS232. Hence it is possible to prevent the corruption and irregularities at ration shop. This would bring the transparency in public distribution system as there will be a direct communication between people and Government through this.

Keywords

AT Commands , GSM Module , RFID Reader , Smart Card.

Introduction

In this section, we are going to provide a brief introduction about automatic rationing for public distribution system (PDS) using RFID and GSM module to prevent irregularities. The Government in India is having a UID (Unique Identification) number system called *AADHAR* number, which contains all related information such as address, contact numbers, bank account information etc. for every resident in the country. Using the *AADHAR* number and contact details, the Government can send a message (SMS) to the individuals, containing information regarding quality and quantity of products allotted to him/her in a respective/specific ration shop. People who are accessing the ration shop for subsidies in the cost of products would be allotted a smart card (electronic ration card). This card is RFID based card containing all information

about the users such as his/her AADHAR number, name and count of family members, their profession, age etc. The automatic rationing system, installed at the ration shop would have three subsections i.e. smart card interfacing to microcontroller, microcontroller and display, GSM module interfacing to microcontroller as well as central database provided by the Government. The person would have to swipe the card on the system placed at ration shop counter. After that for security authentication and to prevent card misuse, the system would ask for the AADHAR number. With the correct entry of password (i.e. AADHAR number) the GSM module would send message to central database for user identification. Once authenticated, automatic rationing system would get updated information regarding the existing subsidies for the current user. Further to prevent irregularities in distribution of ration, Government can provide/supply various products (like rice, wheat, kerosene, cooking oils etc.) to rationing shops in the form of sealed packets instead of the sack. The packets size can be in the following denominations (1 Kg, 2 Kg, 4 Kg, 8 Kg, 1 Lt, 2 Lt, 4 Lt, 8 Lt etc). User can only take the subsidies on products allotted to him/her by Government according to the available database records. Central database would be updated immediately after every transaction made by the users.

Components of the Automated System

Entire Automatic Rationing System can be divided into two parts:

1. Hardware
2. Software

The hardware of this system can be further sub-divided into three parts:

1. The **smart card reader** interfacing with microcontroller (AT89C51) and PC: The RFID based smart-card reader is connected to microcontroller and PC via RS232.
2. **Microcontroller system and PC**: This is an assembly which is placed in between smart card reader and GSM module. It is used to establish the communication between smart card reader and GSM module.
3. **GSM module** interfacing with microcontroller: Here the GSM module is used to exchange the information in form of SMS between microcontroller assembly and central database provided by the Government. This exchanges the information which is required for user authentication as well as for other details.

The software demands for this system are as follows:

1. The smart card reader should be able to send commands to microcontroller when there is a smart-card detected.
2. On receiving commands from smart-card reader the microcontroller should be able to send commands to GSM module to send messages to the central database.
3. GSM module should be able to receive messages from government database and using software it should be able to store/forward it to microcontroller.

Block Diagram & Specifications

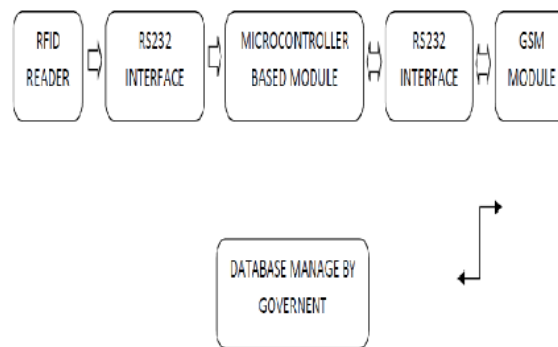


Figure 1: *Block Diagram of the System*

Block Specifications

1. **RFID Reader:** When a user swipes the smart card, and provides the password (i.e. AADHAR number) to the system, it is a smart card reader (electronic device) which detects and reads the RFID Tag (or smart card) and forward the details to the interfaced microcontroller module for further processing. Specifications of RFID Reader is shown in table 1.
2. **RS232:** This protocol provides the required interfacing between RFID reader and microcontroller, also the required interfacing between GSM module and microcontroller.

3. **GSM Module:** It is a device which serves a connection to exchange information/data between automatic rationing system and the central database provided by the Government. Specifications of GSM module is shown in table 2.

Table 1: *Specifications of RFID Reader*

Parameters	Value
Input voltage	9 to 15 V AC/DC
Data speed (Output)	9600 BPS, 8 bit data, No parity bit, One stop bit
Signal level (Output)	Level define by RS232
Detection Range	25 to 30 cm
Tag indication	By LED and Buzzer

Table 2: *Specifications of GSM Module*

Parameters	Value
Datarate	9600 baud CSD
Service Support	GSM data transmission, SMS
Status Indicator	1 LED, Alarm
Antenna Impedance	50 Ω
Digital Input/Output	8 TTL outputs, 8 TTL inputs with 10 k Ω pull-down

AT Commands for GSM Module

After connecting the GSM module to micro-controller, it can be control by sending instructions to it. The instructions which controls the GSM module are called AT Commands. Commands are to controlling sending and receiving of SMS messages.

Table 3 lists the AT commands that are related to sending and writing of message.



Figure 2: GSM Module and Modem [9]

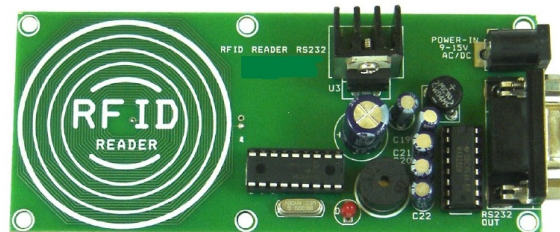


Figure 3: RFID Reader Module [8, 10]

RFID Interfacing with Microcontroller

Each transponder tag contains a unique identifier (one of 2^{40} or 1,099,511,627,776 possible combinations) that is read by the RFID Card Reader and transmitted to the host via a simple serial interface. It means no two tags are same. Each tag has different value. This value if read by reader. When the RFID Card Reader is active and a valid RFID transponder tag is placed within range of the activated reader, the unique ID will be transmitted as a 12-bit printable ASCII string serially to the host in the format shown in figure 4.

Table 3: AT Commands for Writing and Sending Messages

AT Commands	Meaning
+CMGS	Send message
+CMSS	Send message from storage
+CMGW	Write message to memory
+CMGD	Delete message
+CNMI	SMS alert
+CMMS	More message to send

An Example, for a tag with a valid ID of 0F0184F07A, the following ASCII

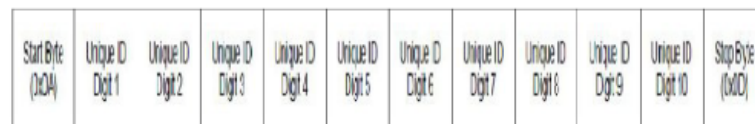


Figure 4: 12-bit printable ASCII string

data would be sent 0F0184F07A Same data in HEX bytes can be interpreted as: 0x0A, 0x30, 0x46, 0x30, 0x31, 0x38, 0x34, 0x46, 0x30, 0x37, 0x41, 0x0D.

All communication is 8 data bits, no parity, 1 stop bit, and least significant bit first (8N1). The baud-rate is configured for 9600 bps, a standard communications speed supported by most any microprocessor or PC, and cannot be changed. The RFID Card Reader initiates all communication. This allows easy access to the serial data stream from any programming language that can open a COM port.

Connecting to the PC

Use the supplied serial cable to connect to PC's serial port. Use Hyper-terminal software which comes with Windows XP or use any other Terminal software with the following settings:

1. Data Rate: 9600,
2. Data Bits: 8,

3. Parity: None,
4. Stop Bit: 1,
5. Flow Control: None

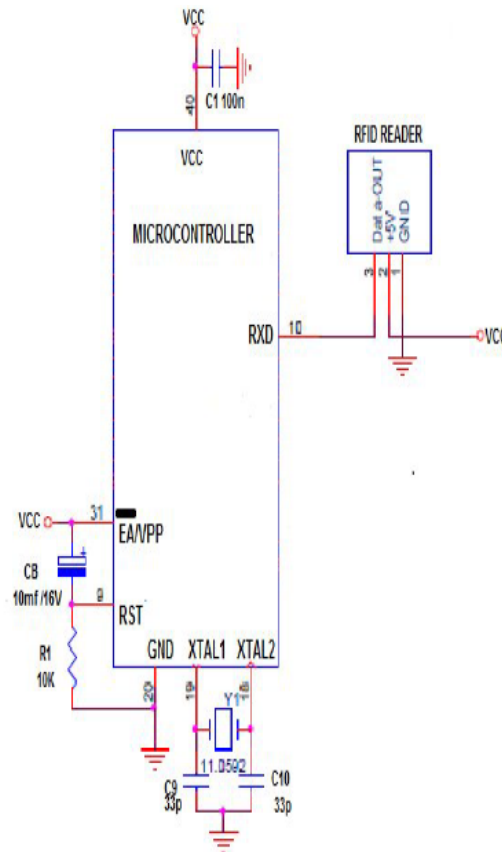


Figure 5: Microcontroller interfacing to RFID module

GSM Module Interfacing with Microcontroller

For interfacing of GSM module with microcontroller one first needs to know the GSM modem create an interfacing environment between microcontroller and government database for exchanging message. The GSM module can accept GSM network operator SIM card and act just like a mobile phone with its own unique phone number. To connect GSM module to microcontroller (PC)

the RS-232 is required. Figure 6 shows the connection of GSM module with microcontroller.

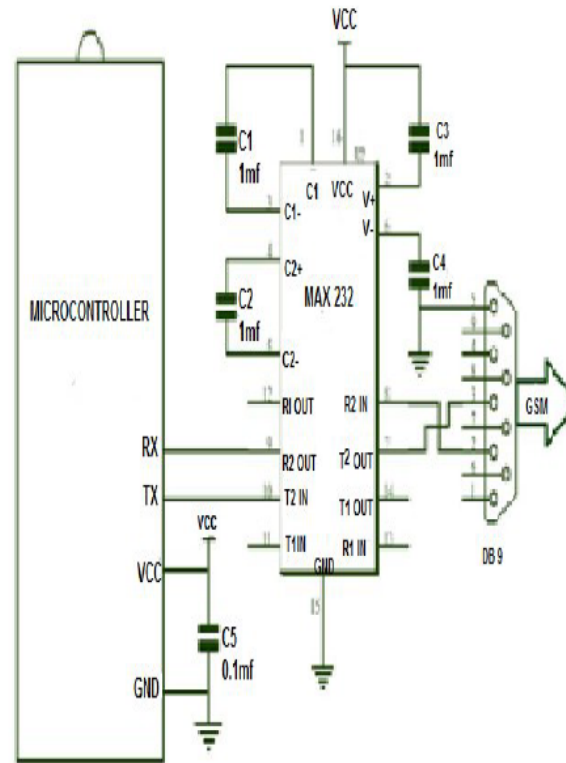


Figure 6: Microcontroller interfacing to GSM module

Conclusion

In this paper, the identification and reception of user information from central database manage by government and placed at remote distance is explained. This project would create the transparency in public distribution system as the work becomes automatic. With help of this it is possible to make public distribution system efficient and free from irregularities.

Future Work

1. The same system with existing components can also be used for keeping employees record in multi-branch organizations. It is possible by creating

common database for multi-branches.

2. It can be also carried out for various remote security application as hardware requirement is same, the difference is that some relay and sensors need to be attached.

References

- [1] Z.Zyonar, Karl Kammeler, Peter Jung, Evolution Towards 3rd Generation Systems, (1988).
- [2] Jorg Eberspacher, Hans-Joerg Vogel, Christian Bettstetter, GSM Architecture, Protocols and Services, (2008).
- [3] RFID Journal, Walmart begin RFID process changes. <http://www.rfidjournal.com/article/articleview/1385>.
- [4] S.Lahiri, RFID sourcebook, USA: IBM press, (2006).
- [5] http://www.omni-id.com/pdfs/Omni-ID_Fit_200_datasheet.pdf.
- [6] <http://www.engineersgarage.com/article/gsm-gprs-modules>.
- [7] Sunrom Technologies, Datasheet - Wireless Serial RF Modem, 2.4 Ghz, 30 mts range, RS232, 06-Feb-2012 (Available online at: <http://www.sunrom.com/files/1253-datasheet.pdf>)
- [8] Sunrom Technologies, Datasheet - RFID Reader, 30-Dec-2011 (Available online at: <http://www.sunrom.com/files/1206-datasheet.pdf>)
- [9] Sunrom Technologies, Datasheet - GSM Modem - RS232 - SIM900D (Available online at: <http://www.sunrom.com/gsm-and-gps/gsm-modem-rs232-sim900>)
- [10] Parallax, Datasheet - RFID Reader Module, (Available online at: <http://www.parallax.com/dl/docs/prod/audiovis/RFID-Reader-v1.1.pdf>)

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