



## Monitoring of Buffet Containers in Hotel for Effective Service Using RFID

### KEYWORDS

RFID, Tag, Reader, ZigBee, Auto ID, Transmitter and Receiver

**Dr. S.Srinivasan**

Professor in ECE, P. B. College of Engineering, Chennai,

**ABSTRACT** RFID (Radio Frequency Identification) emerges as one of the converging technologies. It is a powerful medium for identification of any object and leads all methods in auto ID umbrella. Taste and food culture is nowadays not quite common due to modernization. Job unites peoples from different locations with separate cultural backgrounds. Country like India has so many food habits synchronized with their culture and heredity. Some people like vegetarian food and some may like non vegetarian food. Then so many sub divisions like preferring spicy foods, sweet foods, Dry foods, Liquid foods, Semi Solid food etc. It results buffet system in the hotels and parties. This system satisfies all people needs. But monitoring and managing the food containers is very tough task. For this huge manpower knowledge base is required. Here we are trying to give solution for this based on latest RFID technology.

### INTRODUCTION

In this work, we have come up with an effective method to monitor and manage the food containers in the party hall. RFID is used as a key technology in our work. RFID plays major role in Automated Information System (1), Logistics (3), (4), Textiles, Transportation, Retail, Warehouse management, Freight management, Farm management (7), Library automation (5) etc. Here in our work we are exploring RFID Technology to solve issues in Hotel management. The Plates are pasted with RFID tags and Reader is placed near the containers. Also containers are fitted with weighing machine to monitor the quantity of the food. The Controller used in this work is Peripheral Interface Controller. ZigBee is used for wireless communication and to gather the information's and we can monitor the data's in a display device. So with the help of this system we can monitor the total available quantity, total number of persons had that particular food from the container and quantity required based on the registration and it alerts in the monitor room when the quantity of food has reached to lower level in the container and many more accurate data. It leads so many mathematical and technical calculations but simplifies the issues. By this system we can serve the people with satisfaction. The plates are pasted with RFID Tags which are of passive type. The Reader placed near the container has a small loop antenna connected to it. When the plates with the RFID Tag are brought near the container, the tag and reader communicates with each other with the help of antenna which generates electromagnetic waves.

The information from the reader is sent to the microcontroller and from there it's sent to the transmitter ZigBee using MAX 232 for serial communication. ZigBee uses what's called Carrier Sense Multiple Access Collision Avoidance (CSMA/CA) to increase reliability. Before transmitting, ZigBee listens to the channel when the channel is clear, ZigBee begins to transmit. This prevents radios from talking over one another, causing corrupted data. CSMA-CA is similar to what people do in conversations.

### Transmitter Section

The information from the tag is received with the help of antennas of both reader and tag. The electromagnetic waves generated by the reader antenna activates the tag antenna and the RF power received from reader antenna helps in activating the microchip of the passive tag and hence the information of the tag is sent to the reader.

The reader with the help of the serial port transfers the information from the reader to the PIC microcontroller. The PIC 16F 8777A microcontroller is programmed using MPLAB software. The weighing machine analog output is given to

the microcontroller's ADC pin. The analog information from the weighing machine is converted to digital data with the help of the built in ADC in the microcontroller. Then both the information from the reader and weighing machine is sent to the ZigBee with the help of MAX 232. The MAX 232 IC is used to convert the 5v TTL/CMOS Logic to the RS 232 logic level. The transmitter ZigBee receives the information from the MAX 232 IC and then the transmitter ZigBee transmits the information to the receiver ZigBee.

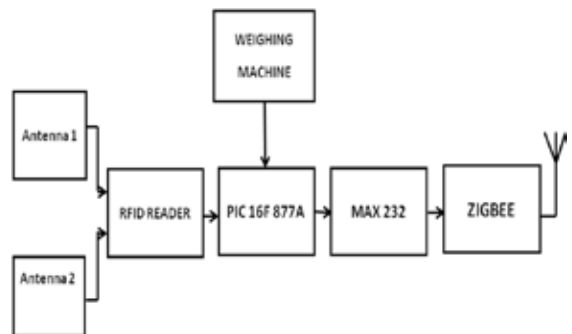


Figure 1-Block Diagram of Transmitter

### RECEIVER SECTION

The information from the transmitter ZigBee is passed to the receiver ZigBee through wireless medium. There is no problem of data transmission loss because ZigBee listens and when it finds that there is no data to be received then it starts to transmit. The information from the receiver is sent to the display device such as Laptop using USB to RS 232 cable for serial transmission of data. The NetBeans software is used for preparing a data sheet of our project.

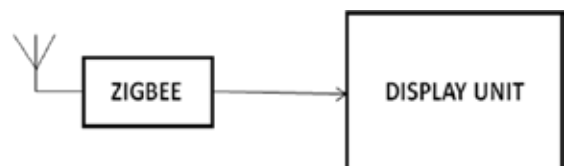


Figure 2 - Receiver

### RFID READER

An RFID interrogator, or more often called an RFID reader, is a RF transmitting and receiving device used to communicate

with an RFID Tag. The device was named as an interrogator because it interrogates the tags. The term "reader" is a more colloquial term, but is sometimes misleading in that many of these devices also have the ability to encode, or write information to an RFID Tag(2). A reader basically acts as an RF sensor because it can communicate with RFID tags that are within its range and is designed to interface with an information process system.

All RFID readers use RF waves for communication and therefore must have one or more antennas. The antenna may be externally connected or in the same housing or enclosure as the RFID reader electronics. There are common frequencies used by RFID technology. Depending on the frequency used, the antennas and RFID Tags have to have certain physical characteristics for the RFID System to operate. The RFID readers are advantageous because no line of sight contact is necessary, it can operate in robust conditions and even at different temperatures.

#### PIC 16F 877A

This powerful (200 nanosecond instruction execution) yet easy-to-program (only 35 single word instructions) CMOS FLASH-based 8-bit microcontroller packs Microchip's powerful PIC architecture into an 40- or 44-pin package and is upwards compatible with the PIC16C5X, PIC12CXXX and PIC16C7X devices. The PIC16F877A features 256 bytes of EEPROM data memory, self programming, an ICD, 2 Comparators, 8 channels of 10-bit Analog-to-Digital (A/D) converter, 2 capture/compare/PWM functions, the synchronous serial port can be configured as either 3-wire Serial Peripheral Interface (SPI) or the 2-wire Inter-Integrated Circuit (I<sup>2</sup>C) bus and a Universal Asynchronous Receiver Transmitter (UART). All of these features make it ideal for more advanced level A/D applications in automotive, industrial, appliances and consumer applications. The highlighted features of this series of PIC microcontroller is 2 PWM 10-bit, 256 Bytes EEPROM data memory, ICD, 25mA sink/source per I/O, Self Programming, and Parallel Slave Port.

#### WEIGHING MACHINE

Weighing machine is a measuring instrument for determining the weight or mass of an object. Weighing scales are used in many industrial and commercial applications, and products from feathers to loaded tractor-trailers are sold by weight. Specialized medical scales and bathroom scales are used to measure the body weight of human beings. The name scales derives from the pair of scales or dishes in which objects to be weighed and the weights / masses against which to weigh them are placed. Spring balances or spring scales measure force or weight by balancing the force due to gravity against the force on a spring, whereas a balance or pair of scales using a balance beam compares masses by balancing the force of gravity (weight) due to the mass of an object against the force due to gravity (weight) of a known mass. Either type of balance or scales can be calibrated to read in units of force (weight) such as Newton's, or in units of mass such as kilograms, but the balance or pair of scales using a traditional balance beam to compare masses will read correctly for mass even if moved to a place with a different (non-zero) gravita-

tional field strength (but would then not read correctly if calibrated in units of force), while the spring balance would read correctly in force in a different gravitational field strength.

#### MAX 232

The MAX232 is an integrated circuit, first created by Maxim Integrated Products, that converts signals from an RS-232 serial port to signals suitable for use in TTL compatible digital logic circuits. The MAX232 is a dual driver/receiver and typically converts the RX, TX, CTS and RTS signals. The drivers provide RS-232 voltage level outputs (approx.  $\pm 7.5$  V) from a single + 5 V supply via on-chip charge pumps and external capacitors.

This makes it useful for implementing RS-232 in devices that otherwise do not need any voltages outside the 0 V to + 5 V range, as power supply design does not need to be made more complicated just for driving the RS-232 in this case. The receivers reduce RS-232 inputs (which may be as high as  $\pm 25$  V), to standard 5 V TTL levels. These receivers have a typical threshold of 1.3 V, and a typical hysteresis of 0.5 V. The later MAX232A is backwards compatible with the original MAX232 but may operate at higher baud rates and can use smaller external capacitors – 0.1  $\mu$ F in place of the 1.0  $\mu$ F capacitors used with the original device. The newer MAX3232 is also backwards compatible, but operates at a broader voltage range, from 3 to 5.5 V.

#### ZIGBEE

ZigBee is a specification for a suite of high level communication protocols using small, low-power digital radios based on an IEEE 802 standard for personal area networks. ZigBee devices are often used in mesh network form to transmit data over longer distances, passing data through intermediate devices to reach more distant ones. This allows ZigBee networks to be formed ad-hoc, with no centralized control or high-power transmitter/receiver able to reach all of the devices. ZigBee is targeted at applications that require a low data rate, long battery life, and secure networking. Applications include wireless light switches, electrical meters with in-home-displays, traffic management systems, and other consumer and industrial equipment that requires short-range wireless transfer of data at relatively low rates.

#### Conclusion

In the existing buffet system the guest carry the normal plates and approach near the dishes which they prefer and serve for themselves or in some cases the server serve the food for them. All calculations were based on assumptions and there was no exact information of the quantity of food used and there are chances of guest being confused with the dishes. The main purpose of our work is to reduce man power and get the datasheet with all the details of the tags and the quantity of food being used.

#### Acknowledgement

The author acknowledges IDRIS USMANI, F, CALLIN ELIZABETH, P, MANIKANDAN, S and ASHA, N of P. B. College of Engineering for their valuable technical support.

#### REFERENCE

- Hoyt, S., St. John, D., Wilson, D. and Bushnell, L. (2003) 'A tree tour with radio frequency identification (RFID) and a personal digital assistant (PDA)', IECON'03, 2-6 November, Vol. 3, pp.2035-2040.
- Klaus Finkenzerler, "RFID Handbook - Fundamentals and Applications in Contact less Smart Cards and Identification", Wiley, 2003, Chapt.1, 2, 13.
- Robert A. Kleist, T.Theodore A.Chapman, DavidA. Sakai, Brad S. Jarvis, "RFID Labeling - Smart Labeling Concepts & Applications for the Consumer Packaged Goods Supply Chain", Printronix, 2004, pp93-95
- Yoon S. Chang, Harris C. Makatsoris, Howard D. Richards, "Evolution of Supply Chain Management - Symbiosis of Adaptive Value Network and ICT", 2004, pp 41, 383-384
- Alan Butters, Principal Consultant, Sybis, "RFID IN AUSTRALIAN ACADEMIC LIBRARIES: EXPLORING THE BARRIERS TO IMPLEMENTATION", AARL September 2008 vol 39 no 3 pp 198-206.
- Miyamoto, Y., Katoh, Y.; Uchida, K.; Shioda, D.; Tokai, T.; Kakiyama, T., "Development of The Tuna Fish Catch Information Management System using RFID and a Communications Satellite", DOI: 10.1109/OCEANSAP.2006.4393877. May 2007, 1-5