

# Jewellery Inventory and Management System using RFID

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**Abstract**— This paper proposes jewellery inventory and management system using RFID system to replace the current method of stock taking. The RFID based jewellery inventory management requires lesser time compared to any other technique and also remotely calculating the stock. In this system a RFID tag is attached to jewellery item, RFID reader detects that tag and records the data. In this system hardware containing controller interfaced with the HF range RFID reader and a display and together it makes a dependable jewellery inventory system. If any jewellery is misplaced, then it is very time consuming and difficult task to find it manually, but with RFID tag detector system, misplaced item can be found easily if it has tag attached with it, and more than one misplaced tag can be found at a same time using proposed system. Most important feature of this system is tag detector is wirelessly connected with PC.

**Key words:** RFID, inventory system

## I. INTRODUCTION

Jewellery items made from gold, silver, platinum and diamond are extremely expensive and the proper stock management is highly required in this business.[14] All the big jewellers are having huge amount of stock with them and the stock inventory is one of the most complex tasks in this business. Though it is tedious job yet very important to do on the daily, monthly and yearly bases. Most of the jewellers are using manual method for the stock calculation which make the system time consuming and the chances of errors are very high because of the continuous human involvement.

As all the items are extremely precious, human error can cause a great loss to the organization. So to avoid this issue RFID based inventory system can be used which is accurate and reliable.

For the identification of the jewellery, many people are using barcode technology which has many disadvantages as it also need human involvement up to much extent ,it requires direct line of sight, cannot detect more than one tag at a time[12], can be used only once. RFID is similar to bar code technology but uses radio waves to capture data from tags, rather than optically scanning the bar codes on a label. RFID does not require the tag or label to be seen to read its stored data which is one of the key characteristics of an RFID system. [13]

RFID is an inexpensive technology that enables wireless data transmission, can be implemented for several applications such as security, asset tracking[14], people tracking, inventory detection, Access control applications [6]. This system has many features which are targeted to solve the practical issues faced by the jewellers.

## II. RFID TECHNOLOGY OVERVIEW

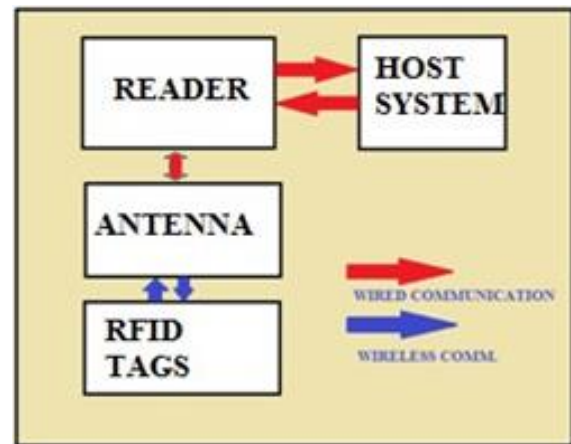


Fig. 1: Technology Overview

### A. RFID Tags

The tag is the basic building block of RFID.[13] RFID tags consist of an integrated circuit (IC) attached to an antenna typically a small coil of wires- plus some protective packaging (like a plastic card) as determined by the application requirements. IC contains a radio receiver, a radio modulator for sending a response back to the reader, control logic, some amount of memory, and a power system. Tags are also called as transponders or inlays. RFID tags can come in many forms and sizes. Some can be as small as a grain of rice. Data (i.e tag ID) is stored in the IC and transmitted through the antenna to a reader.

Categories of RFID Tags

RFID tags can be categorized with respect to:

- 1) Range.
- 2) Read/Write Property.

#### 1) Range

**Active RFID Tags:** The active tags are bit bigger in size than the passive tags and the cost of the active tags are much higher than the passive tags because of the power supply for each tag. The primary advantages of active tags are their reading range and reliability. With the proper antenna on the reader and the tag, a 915MHz tag can be read from a distance of 100 feet or more .[7] The tags also tend to be more reliable because they do not need a continuous radio signal to power their electronics. Typically they are used to track high value goods like vehicles and large containers of goods. Shipboard containers are a good example of an active RFID tag application.

**Passive RFID Tags:** They do not contain a battery. Instead, they draw their power from the radio wave transmitted by the reader. The reader transmits a low power radio signal through its antenna to the tag, which in turn receives it through its own antenna to power the integrated circuit (chip). The tag will briefly converse with the reader for verification and the exchange of data. As a result, passive tags can transmit information over shorter distances (typically 3 meters or less) than active tags. They have a

smaller memory capacity and are considerably lower in cost making them ideal for tracking lower cost items.

**Semi Passive Tags:** Between the active and the passive tags are the semi passive tags. These tags have a battery, like active tags, but still use the reader's power to transmit a message back to the RFID reader using a technique known as backscatter. These tags thus have the read reliability of an active tag but the read range of a passive tag. They also have a longer shelf life than a tag that is fully active.

### B. Read/Write Property

There are two basic types of chips available on RFID tags.

**Read Only:** These chips are programmed with unique information stored on them during the manufacturing process often referred to as a number plate application. The information on read only chips cannot be changed.

**Read/Write:** With these chips, the user can add information to the tag or write over existing information when the tag is within range of the reader. Read / Write chips are more expensive than Read only chips. Applications for these may include field service maintenance or item attendant data, where a maintenance record is associated with a mechanical component that is stored and updated on a tag attached to the component. Another method used is something called a WORM chip (Write Once Read Many). It can be written once and then becomes Read Only afterwards.

### C. RFID Reader

The RFID reader sends a pulse of radio energy to the tag and listens for the tag's response.[10] The tag detects this energy and sends back a response that contains the tag's serial number and possibly other information as well. In simple RFID systems, the reader's pulse of energy functioned as an on-of switch; in more sophisticated systems, the reader's RF signal can contain commands to the tag.

### D. RFID Technology

RFID means Radio Frequency Identification. RFID is comprehensive system, that includes three basic elements: RFID tag (transponder), reader (transceiver), and back-end application system (or database), which demands the support of the computer network.[6] The software is used for management, and maintaining record of the various users.

The RFID tag is the unique identifier normally attached to items. The reader sends out electromagnetic waves, and a magnetic field is formed when the signal from the reader couples with the antenna of tag. The unpowered RFID tag draws its power from this magnetic field, and this power enables the tag to send back an identifying response to RFID reader.

## III. RFID IN JEWELLERY STOCK INVENTORY APPLICATION

In every business, stock counting and making inventory data is a time consuming and difficult job. Some of the big jewellers in this business deal with hundreds of kilograms and stock taking for the same become a lengthy process. It takes a lot of man power so apart from making the system

laborious, it adds the chances of the errors as it constantly needs human involvement. In this kind of expensive things they cannot afford to have errors which can lead them to a loss.

To deal with the kind of issues these jewellers are facing, highly automated system is required to handle the stock of these precious jewels. As the solution of these problems RFID technology can be used successfully to eliminate the current issues which vendors are facing. RFID is a rapidly growing and most widely preferred technology of today's automatic identification industry. By using this technology, the human involvement is almost eliminated thereby minimizing the chances of errors. This technology increases the overall system efficiency.

## IV. PRINCIPLE OF OPERATION OF THE SYSTEM

Figure 2 shows block diagram of Jewellery inventory and management system using RFID. RFID tag is attached with every jewellery item, now when this tag comes in readers reading range, reader will detect presence of tag, reader will send radio pulses to tag, tag gets power and sends response to reader in form of its ID number. Reader converts this information into digital form and then gives to the controller. LCD display will display number of present tags. If any detail of this jewellery item is needed then it can get from PC. Controller is wirelessly connected with PC.

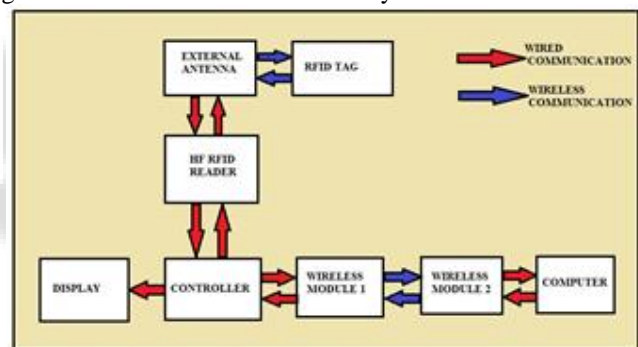


Fig. 2: Block diagram of wireless jewellery inventory and management system

For the details of each and every items which are detected the network of reader and the hardware is connected with the PC and then the details can be seen as the computer is having more storage capacity compared to the controller memory.

The purpose of connecting the hardware to PC is to add the large amount of storage capacity as compared to the controller and also for a display purpose where the jewellery stock and inventory can be easily monitored as well as managed.

## V. FINDING OF MISPLACED JEWELLERY

We can find any misplaced item, if RFID tag is attached to it. From inventory database, one can know which item is misplaced and its tag ID.

Then it becomes simple task to find that misplaced item. We just need to send tag ID of that item to controller, then it will compare that ID with all the IDs that comes in readers range, if tag ID of misplaced item match with tag ID sent from reader then LED will glow. With this system, it is

possible to find more than one misplaced item simultaneously.

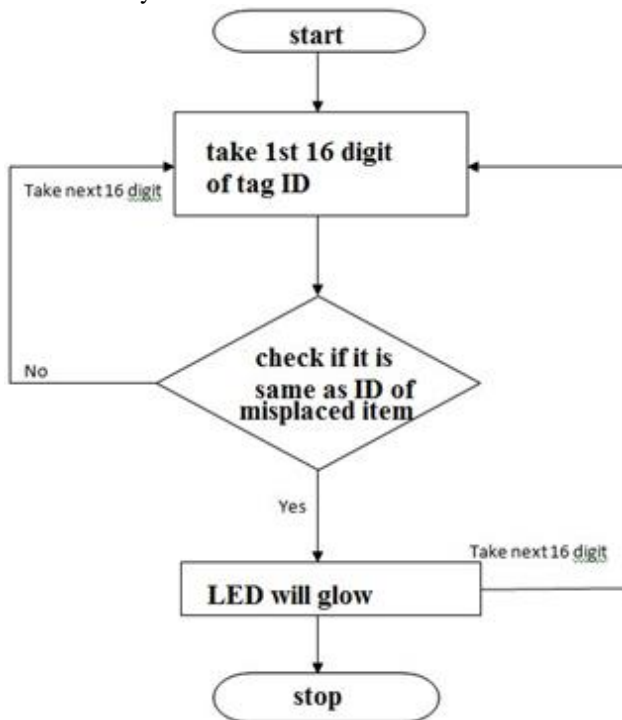


Fig. 3: Flow Chart



Fig. 4: Snapshot of Hardware

## VI. CONCLUSION

Through this paper, we can conclude that through this hardware based on the RFID technology it is possible to do simultaneous detection of the tags as well as the line of sight is not require in the RFID technology. By experimenting we can also conclude that RFID tags can be detected even if they are in the plastic/leather box. The limitations of manual as well as barcode system were mostly like time taking in the inventory process and the human involvement. By using RFID technology these issues can be solved. This feature makes the system rapid and provides great convenience to the vendor. Plus after adding the details of the jewellery for the first time, there will be no major involvement of the human which can cause the error. By reducing the human involvement the chances of error gets

reduce and more robust automation system can be provided and most important feature is finding misplaced item. So at the end of this paper we can conclude that it is a raw form of product but still by using this product we can take faster inventory daily as well as we can add convenience in the managing the inventory which not only saves the huge amount of time and energy but also adds accuracy, precision and safety which any other system in the Current market is not providing by manual or barcode method.

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