RFID TECHONOLOGY IN LIBRARIES: AN OVERVIEW

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Abstract

Radio Frequency Identification (RFID) is the technology that is slated to replace barcodes in library applications. It is a form of identification that is contact-less and does not require line of sight. The RFID tags are placed in books and generally covered with a property sticker. Antennas of different sizes, based on application, are used to read the tags and manage the various library functions. The RFID Solution is a revolutionary application of automatic identification and data capture (AIDC) technology. In a library environment, RFID technology resembles a traditional barcode system in that it provides a means of assigning an ID to an item and reading that ID to perform circulation transactions or to take inventory. But while RFID technology resembles a traditional barcode system in application, the RFID Solution is far superior in performance—plus it offers built-in security. The paper presents on various components, overview of RFID, and its advantages and disadvantages.

Keywords : RFID Technology, Barcode, RFID Components

1.   Introduction

An RFID-system (Radio Frequency Identification) consists of a transponder and a read/write unit. Both have internal intelligence and an antenna, which receives, sends and stores data. The read/write unit sends out a signal causing the transponder to respond and transfer its own signal, containing encoded information. The transponder signal is decoded in the read/write unit and sent to a selected control unit (e.g. host computer). The read distance of common RFID-systems (passive systems without battery) is typically 1 meter (between 3 and 4 feet). The necessary components (Integrated Circuits and antennas) are specially chosen to fit the needs of mass-market applications. 13.56 MHz is a worldwide-approved frequency supported by many organizations for an international RFID-standard in particular markets and applications.
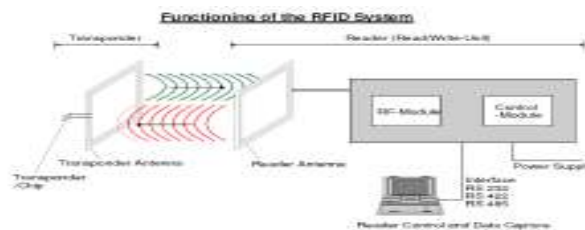
2.   RFID Technology overview

RFID or Radio Frequency Identification is the Auto-ID technology by which one can identify objects and track information about them using wireless radio waves. In the simplest terms an RFID system consists of a TAG (transponder) and a READER (interrogator). The technology of RFID deals with the remote collection of information stored on a tag using radio frequency communications. Information stored on

the tag can range from as little as an identification number, to kilo-bytes of data written to and read from the tag, to dynamic information maintained on the tag, such as temperature histories. The information from the tag/reader combination is either presented to a human operator typically using a hand-held device or a host computer which automatically manages the information.

Critical performance variables of an RFID system determine the cost of implementation.

- Read Range - Range at which communication can be maintained
- Memory - Size of the information space contained on the tag
- Speed - The rate at which the communication with the tag can take place
- Size - The physical size of the tag
- Simultaneous read - The ability of the system to "communicate simultaneously with multiple tags
- Interference - The reliability of communication with respect to interference due to material in the path between the reader and the tag
- Accuracy - Read success rate especially in presence of many tags
- Life & Re-use - Tags should be robust to handle harsh temperatures and environments. Battery life limits life of tag.

Several factors determine the level of performance that can be achieved in these variables.

- Legal/regulatory emission levels allowed in the country of use.
- Battery is included in the tag to assist its communication or not.
- Frequency of the RF carrier used to transport the information.

3. Components of the RFID System

The components of RFID System are;

- RFID tags
- RFID readers
- Antennae

3.1 RFID Tags

RFID tags are attached on objects, to identify them and can store information. Tags are classified based on their characteristics.

Active and Passive tags

- Active tags use a battery to power its chip,
- Passive tags use the energy of the RF signal from readers.

Frequencies

- Low Frequency (LF) – 125 KHz

- High Frequency (HF) – 13.56 MHz

- Ultra High Frequency (UHF) – 433 to 960 MHz – region specific

- Microwave – 2.4 to 5 GHz Dual Frequency (DF) – power up at 125 KHz & Backscatter at 6.8 MHz

Read/Write capability

- Read Only

- Write Once Read Many

- Write Many Read Many

Tag/Reader Communication Protocols

- Reader talks first

- Tag talks first

3.2 RFID Readers

RFID readers consist of a transmitter, receiver, antennae and a decoder. They communicate with RFID tags, identify them and retrieve data stored on the tag. Different types of RFID readers:

- Fixed readers - Entry/Exit, Conveyer etc

- Mobile readers - handheld readers, forklift readers etc

- Dual Barcode and RFID readers

3.3 Mid Range Reader and Writer

It comprises of a mid-range reader. The equipment can easily be connected to a network or single workstation PC or notebook and the application can begin functioning thereon. It also supports all RFID functions like Anti-collision feature, allowing to identify multiple labels simultaneously present in the reader field and full read / write capability. This equipment also supports various technologies like i-Code, Tag-it, and the latest ISO 15693.

Gate Antenna