

RFID: UNIQUE IDENTIFICATION TECHNIQUE FOR ATTENDANCE SYSTEM

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ABSTRACT

RFID means Radio Frequency Identification is a wireless identification technique which becomes very much popular and having lot of importance these days and is used to identify the physical objects like products, humans, animals etc by the use of radio frequency. It can read much more data and from a much farther distance as compared to that of barcode but above all it has a sparking feature of security. The tag is the identifying element of the product. It is used in wide variety of applications. In this paper, we are describing basics of Radio Frequency Identification System, Working of RFID; Wiegand 26 bit Format, Differences between RFID & Barcode technique & application in attendance system.

Keywords: *RFID, Wiegand 26 bit Format, attendance system using RFID.*

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I. INTRODUCTION

RFID is abbreviated as Radio Frequency Identification. The number of cycles travelled in a second is defined as frequency. The energy packets that transfer information from one place to another are called as waves. Radio frequency waves are the waves whose frequency band lies in the range of 3 KHz to 300 GHz, thus it is a wireless technique of identifying objects.

RFID makes use of electrostatic and electromagnetic coupling and encoding techniques and a variety of modulation techniques between chip and the reader for transferring the data. Electromagnetic Coupling may be defined as that Coupling which exists between circuits when they are mutually affected by the same electromagnetic field, whereas Electrostatic refers to the phenomena of static (without acceleration) electric charges.

Modulation may be defined as the technique of transferring the data to longer distance by introducing the carrier wave to the modulating wave. Encode is to put (a message, for example) into code. And Encoding is defined as converting the data from one suitable form to another suitable form.

II. COMPONENTS

The term **RFID Tag** is often used as a general term to describe not only RFID Tag but RFID Labels and RFID Cards. It is important to know which frequency your RFID solution operates at and what type of product the tag be affixed to before searching for a RFID tag. If your application is to track a metal tote you would want a RFID tag that is designed to be mounted on a metal surface (Metal RFID Tags).

If you need additional information on a particular product please click on the “Request Info” link next to the product .An RFID tag is a microchip combined with an antenna in a compact package; the packaging is structured to allow the RFID tag to be attached to an object to be tracked. RFID Tag is an IC chip that has unique hexadecimal or electronic product code (EPC) contained in it.

Here ‘UNIQUE’ refers that each and every code word of the tag is independent of other code word. The tag acts as a key that is capable of opening a particular lock. So, it is also named as RFID key.

The tag is classified into 2 categories: active tags and passive tags.

RFID Tag Attributes

	Active RFID	Passive RFID
Tag Power Source	Internal to tag	Energy transferred using RF from reader
Tag Battery	Yes	No
Availability of power	Continuous	Only in field of reader
Required signal strength to Tag	Very Low	Very High
Range	Up to 100m	Up to 3-5m, usually less
Multi-tag reading	1000's of tags recognized – up to 100mph	Few hundred within 3m of reader
Data Storage	Up to 128kb or read/write with sophisticated search and access	128 bytes of read/write

Figure 1: Active and Passive RFID tags

Active tags are active in nature i.e. they do not require any external source, they have their own in-built battery. It can transmit high frequencies so it can be detectable to a longer range.

Passive tags are passive in nature i.e they don't have any battery source built in them. They transmit low frequencies so they are detectable up to few meters of distance.

Various RFID tags being used are: Aerospace RFID Tags, Agriculture RFID Tags, Apparel RFID Tags, Automotive RFID Tags, Baggage RFID Tags, Car Wash RFID Tags, Chemical RFID Tags, Cold Chain RFID Tags, Construction RFID Tags, Data Center RFID Tags

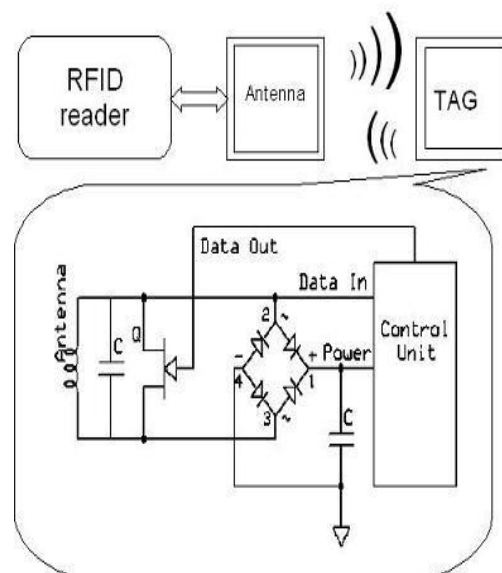


Figure 2: RFID Passive Tag

RFID Reader is a system which transmits and receives the data to the tag or key by radio waves. An RFID reader is a device that is used to interrogate an RFID tag.

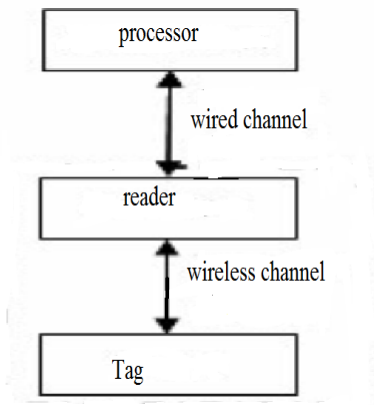


Figure 3: RFID Reader & Tag

The reader has an antenna that emits radio waves; the tag responds by sending back its data.

III. WIEGAND 26-BIT PROTOCOL

Wiegand is the technique used by the sensors or readers to access the product. Protocols are the rules needed for communication purpose. The Wiegand protocol used 26-bit binary format. It consists of a set of wires in the form of magnetic stripe. These wires contain any kind of data like user identification, security information, medical history etc. When a card is passed from the front of the reader, the reader checks the information stored in it and then passed it to processor. The Wiegand protocol is suitable with every kind of environment.

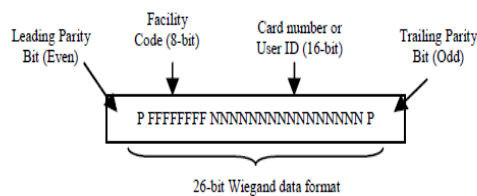


Figure 4: Standard Wiegand 26-bit format

Bit Number	Purpose
Bit 1	Even parity over bits 2 to 13
Bits 2 to 9	Facility code (0 to 255); Bit 2 is MSB
Bits 10 to 25	ID Number (0 to 65,535); Bit 10 is MSB
Bit 26	Odd parity over bits 14 to 25

Figure 5: Bits description in Weigand 26 bit Format

The Wiegand interface uses three wires:

1. Common ground wire.
2. DATA0 and DATA1 also called as Data Low and Data High.

When system is in IDLE state both DATA0 and DATA1 are high. When a 0 is sent the DATA0 is at a low voltage while the Data High wire stays at a high voltage.

When a 1 is sent Data1 is at the low voltage while Data Low stays at the high voltage. The high voltage level is usually +5VDC .It consists of leading and trailing parity bits, 8-bit facility code, 16-bit user ID.

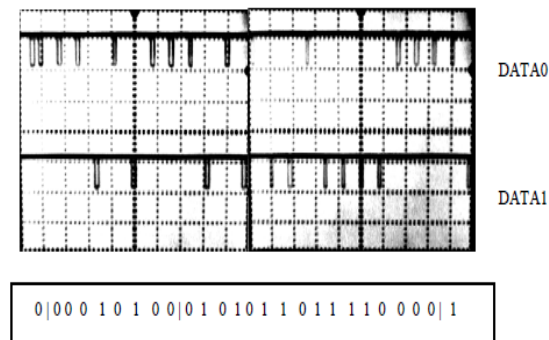


Figure 6: Wiegand waveform

IV. RFID V/S BARCODE

There are many similarities and differences between RFID and barcode. The most common similarity is that both are being used for identifying an item. They differ in the area of line of sight, distance, effectiveness and many more like environmental conditions, capacity, efficiency etc.

- The RFID doesn't require line of sight (LOS) between reader and chip while barcode requires LOS.
- RFID can read data up to 100's of feet but barcode can read data up to several feet.
- RFID reader can read more than 100 chips or tags simultaneously while barcode only 1 chip at a time. So, RFID takes less time than barcode and hence it is more efficient than barcode.
- In RFID radio frequency Technology is used whereas in barcode LASER Technology is used.
- RFID is not affected by environmental conditions whereas barcode is affected by environment.
- RFID is reprogrammable i.e. its programming can be modified after some time but barcode is not reprogrammable i.e. once it's programmed, after that its contents can't be changed.
- Capacity of RFID is more than that of barcode.
- It is very much difficult to copy RFID tag but barcode chip can easily copy.

- RFID doesn't require human interference while barcode requires human to operate scanners.
- Barcode is cost effective or cheaper than RFID.
- As RFID can scan multiple tags at a time so there is a possibility of collision whereas this not in the case of barcode.

V. WORKING OF RFID

A Radio-Frequency IDentification system has three parts:

- (i) A scanning antenna,
- (ii) A transceiver with a decoder to interpret the data,
- (iii) A transponder - the RFID tag - that has been programmed with information.

The scanning antenna puts out radio-frequency signals in a relatively short range. The RF radiation does two things:

- (i) It provides a means of communicating with the transponder (the RFID tag)
- (ii) It provides the RFID tag with the energy to communicate (in the case of passive RFID tags).

This is an absolutely key part of the technology; RFID tags do not need to contain batteries, and can therefore remain usable for very long periods of time (maybe decades).

The scanning antennas can be permanently affixed to a surface; handheld antennas are also available. They can take whatever shape you need; for example, you could build them into a door frame to accept data from persons or objects passing through.

When an RFID tag passes through the field of the scanning antenna, it detects the activation signal from the antenna. That "wakes up" the RFID chip, and it transmits the information on its microchip to be picked up by the scanning antenna.

RFID is used for identifying an item or product. Each product contains the tag. Each tag has a unique code contain in it. Both tag and reader have their own antennas which are used for transmitting and receiving the waves.

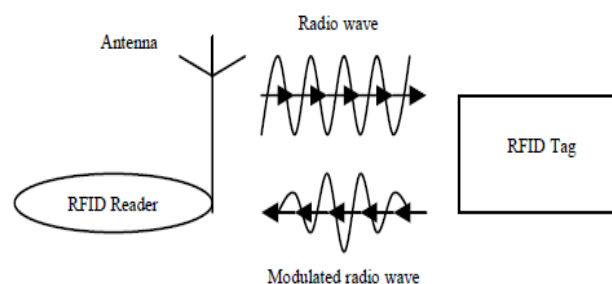


Figure 7: Working of RFID

Reader generates the radio wave that reaches to the tag. The tag reflects back the combination of the radio wave and the data contain in it. The reader is connected to the processor and retrieves the information about the tag from it.

VI. APPLICATION OF RFID IN ATTENDANCE SYSTEM:

The attendance system is basically an embedded one. Here, the software using a Microcontroller controls all the hardware components. The microcontroller plays an important role in the system. The main objective of the system is to uniquely identify and to make attendance for a person. This requires a unique product, which has the capability of distinguishing different person. This is possible by the new emerging technology RFID (Radio Frequency Identification). The main parts of an RFID system are RFID tag (with unique ID number) and RFID reader (for reading the RFID tag). In this system, RFID tag and RFID reader used are operating at 125 KHz. The EEPROM used for storing the details has the capability of storing 256 person details at a time. The PC can be used for restoring all the details of attendance made.

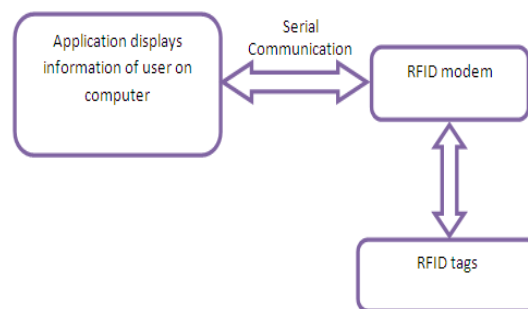


Figure 8: Model of RFID based Attendance system

VII. DISADVANTAGES

- IMPLEMENTATION of RFID is difficult as it requires complete knowledge about the system.
- INTERFERENCE is the main problem in prone areas however it is minimized by employing multiple antennas.
- It's NOT COST-EFFECTIVE as reader and tag are costly components.
- The main problem is COLLISION. Whenever more tags are come in front of the reader there is always a chance of wrong interpretation.

VIII. CONCLUSION

In this paper the RFID Based identification and its applications are discussed also RFID system can run using power adapter or battery power. Therefore, it is very portable and can be carried. The identification process is secure and accurate since the tag ID encoding is done

using Wiegand 26-bit format. More over it is much more user-friendly with easily accessible switches and communication ports. The data can be stored and retrieved easily. Another advantage of the system is it has high verification speed. This system can be applied in many areas as explained in applications.

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