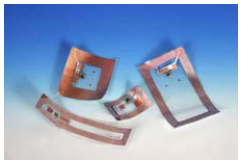
RFID 101

Overview- Radio Frequency Identification or RFID can be classified as a wireless means of automatically transmitting data through the use of radio frequencies between objects, things or people and computer systems. A complete RFID System consists of a Transmitter/ Responder or Transponder, more commonly called a tag, an antenna, interrogator or reader and a computer system.



Transponder or Tag A transponder is made from various components. There is a semiconductor integrated circuit or IC which provides the intelligence and data storage capacity for the tag. An antenna which provides the means for communicating via radio frequencies and on some tags a battery or power source. All of these components play a role in the performance of the tag. The IC used determines which radio frequency, protocol and data storage capacity. There are two basic types of transponders, active and passive. Active tags are tags that have an integrated power supply or battery and passive tags which have no power supply. Passive obtains their power from the radio frequency provided by the reader through a process called inductive or capacitive coupling.

Reader or Interrogators Readers are electronic devices that provide am interface between an antenna , the tag and computer system. They generate the radio frequency, which in the case of passive tags powers the tag, through an antenna which is used for sending and receiving data from the tag.. They typically have a processor for managing the incoming data received from the tag and data transmitted to the tag.. Once the communication with the tag is complete the data is decoded and transmitted to a computer system for processing.

Antenna— Antennas are available in many shapes and sizes and are specific for each of the different radio frequencies used in RFID. They typically consist of copper and various electronic components that tune the antenna for the intended frequency.

RFID Frequencies– Today there are currently four frequency ranges used for RFID. The first is 125 KHz this is referred to as low frequency or LF. This frequency is used for the Mobil's Speed Pass. The second frequency is 13.56 MHz or High Frequency or HF. This is the frequency used for Smart Cards. The third frequency is 868-915 MHz Ultra High Frequency or UHF. This is the frequency used for the Electronic Product Code and DOD. The last frequency is 2.45 GHz & 5.8Ghz microwave or uW. This is the frequency generally used for toll collection applications. The following chart outlines the characteristics of the different frequency ranges:

Frequency	LF 125 KHz	HF 13.56 MHz	UHF 888-915 MHz	Micro 2.4GHz-5.8GHz
Typical Read Ranges Passive Tags	< 0.50 Meters	- 1.0 Meter	-3.0 Meters	-1.0 Meters
Characteristics	Very short read range, least susceptible to performance problems from metal and liquids	Less expensive than LF tags, short read range	Least expensive tags, longest read range and fast data transfer rates, more susceptible to performance problems from metal and liquids	Expensive tags, fastest data transfer rates, most susceptible to performance problems from metal and liquids, most directional signal
Tag Power Source	Passive	Passive	Passive	active
Applications	Access control, animal tracking, automobile immobilization, POS— Speedpass	Smart Cards, item level tracking, libraries	Pallet tracking and baggage handling	Electronic toll collection
Notes	Mature technology with largest installed base	Widely accepted and adopted world wide	Different frequency regulations world wide not allowed in Japan	