**TRANSPONDER:**

The Transponder or tag is fixed on to the baggage to be tracked in the airport. When this tag comes within the range of the reader or integrator, the tag is energized. Now, this tag transmits the data to the reader.

This data is automatically sent to the micro-controller for further processing. The time at which the tag is sensed is sent to the micro-controller from the RTC (Real Time Clock).

These details are displayed on LCD (Liquid Crystal Display) .The same is sent to the EEPROM (Electrically Erasable and Programmable Read Only Memory), which is used as a backup. It can be stored, and retrieved.

**PASSIVE TAG AND READER:**

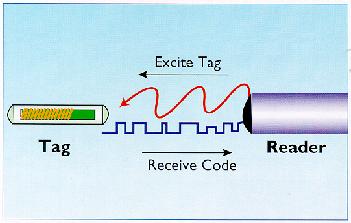
Passive tags are those energized by the reader itself, they contain no power source, typically have very long lifetimes (near indefinite) a drawback over active tags is the read range, typically 2cm (1in) to 1.5m (4.5 ft), a strong positive is individual tag cost. RFID Passive tag is composed of a integrated electronic chip and a antenna coil that includes basic modulation circuitry and non-volatile memory.

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Different types of tags

For most general applications passive tags are usually the most cost effective. These are made in a wide variety of sizes and materials: there are durable plastic tags for discouraging retail theft, wafer thin tags for use within "smart" paper labels, tiny tracking tags which are inserted beneath an animal's skin and credit card sized tags for access control. In most cases the amount of data storage on a passive tag is fairly limited - capacity often being measured in bits as opposed to bytes.

However for most applications only a relatively small amount of data usually needs to be codified and stored on the tag, so the limited capacity does not normally pose a major limitation. Most tags also carry an unalterable unique electronic serial number, which makes RFID tags potentially very useful in applications where item tracking is needed or where security aspects are important.



###### Interaction between tag and reader

The reader powers the tag (transponder), by emitting a radio frequency wave. The tag then responds by modulating the energizing field. This modulation can be decoded to yield the tags unique code, inherent in the tag. The resultant data can be the passed to a computer from processing. Tags have various salient features apart from their physical size: Other available features are: Read Only, Read Write, Anti-Collision.

## *Operating Principles Of RFID Systems:*

There are a huge variety of different operating principles for RFID systems. The most important principle is inductive coupling, which is described in detail below.

**Inductive coupling:**

An inductively coupled transponder comprises of an electronic data-carrying device, usually a single microchip and a large area coil that functions as an antenna. 

Inductive Coupling

Inductively coupled transponders are almost always operated passively. This means that all the energy needed for the operation of the microchip has to be provided by the reader. For this purpose, the reader's antenna coil generates a strong, high frequency electro-magnetic field, which penetrates the cross-section of the coil area and the area around the coil. Because the wavelength of the frequency range used (< 135 kHz: 2400 m, 13.56 MHz: 22.1 m) is several times greater than the distance between the reader's antenna and the transponder, the electro-magnetic field may be treated as a simple magnetic alternating field with regard to the distance between transponder and antenna.

A small part of the emitted field penetrates the antenna coil of the transponder, which is some distance away from the coil of the reader. By induction, a voltage Vi is generated in the transponder's antenna coil. This voltage is rectified and serves as the power supply for the data-carrying device (microchip). A capacitor C1 is connected in parallel with the reader's antenna coil, the capacitance of which is selected such that it combines with the coil inductance of the antenna coil to form a parallel resonant circuit, with a resonant frequency that corresponds with the transmission frequency of the reader. Very high currents are generated in the antenna coil of the reader by resonance step-up in the parallel resonant circuit, which can be used to generate the required field strengths for the operation of the remote transponder.

The antenna coil of the transponder and the capacitor C1 to form a resonant circuit tuned to the transmission frequency of the reader. The voltage V at the transponder coil reaches a maximum due to resonance step-up in the parallel resonant circuit.

As described above, inductively coupled systems are based upon a transformer-type coupling between the primary coil in the reader and the secondary coil in the transponder. This is true when the distance between the coils does not exceed 0.16 times the wavelength, so that the transponder is located in the near field of the transmitter antenna

If a resonant transponder (i.e. the self-resonant frequency of the transponder corresponds with the transmission frequency of the reader) is placed within the magnetic alternating field of the reader's antenna, then this draws energy from the magnetic field. This additional power consumption can be measured as voltage drop at the internal resistance in the reader antennae through the supply current to the reader's antenna. The switching on and off of a load resistance at the transponder's antenna therefore effects voltage changes at the reader's antenna and thus has the effect of an amplitude modulation of the antenna voltage by the remote transponder. If the switching on and off of the load resistor is controlled by data, then this data can be transferred from the transponder to the reader. This type of data transfer is called load modulation.

To reclaim the data in the reader, the voltage measured at the reader's antenna is rectified. This represents the demodulation of an amplitude-modulated signal.

**Technical Specifications:**

|  |  |
| --- | --- |
| Frequency: | 125 KHz / 13.56 MHz / 915 MHz / 2.45 GHz Read/Write |
| Distance: | Up to 6m (with mounted antenna) |
| Dimensions | Varies, as small as 0.8mm diameter |
| Weight: | 6-54g |
| Memory: | Up to 16 Kbits |
| Data durability: | 10 Years |

**The advantages of a passive tag are:**

The tag functions without a battery; these tags have a useful life of twenty years or more.

* The tag is typically much less expensive to manufacture
* The tag is much smaller (some tags are the size of a grain of rice). These tags have almost unlimited applications in consumer goods and other areas.
* Tags can be read through a variety of substances such as snow, fog, ice, paint, crusted grime, and other visually and environmentally challenging conditions, where barcodes or other optically read technologies would be useless.
* RFID tags can also be read in challenging circumstances at remarkable speeds, in most cases responding in less than 100 millisecond

Antenna:

A reader reads identifiers from tags on pallets conveyed past the reader. The reader includes two interleaved linear arrays of antennas with circularly polarized fields. Each antenna is composed of a pair of crossed rods phased to have adjacent antennas of an array generate circularly polarized fields of opposite rotation.



**Antenna**

The vector components of the polarization in the direction across the width of the conveyor have peaks and nulls, and the interleaved arrays are arranged such that the nulls of one array's fields are covered with the peaks of the other array's fields. This arrangement allows the reader to the identifier from the tag when the tag is at any orientation. A tag at the side of the reader is aligned in the direction of travel by rails on the conveyor. The reader has antennas aligned in the direction of travel to read such tags.