

The Fundamentals of a Passive RFID System

BASIC OPERATION

Technology: Passive RFID System

Area of Application: RFID is used to accurately identify an object on which the tag is placed. In addition to identification, object-specific information, like maintenance data is contained on the tag.

How It Works: Since passive RFID tags contain no battery, the tag is powered up or “woke up” by the RF waves emitted from antenna of the same frequency. Once a tag is located in range it is powered up by the antenna and its memory can be read and transmitted to the processor. The time it takes the reader to extract information from the tag is usually measured in milliseconds.

Passive RFID System Components

Tag



A combination of a chip and internal coil. The chip is where the data is held in the memory and can contain a few bytes of data or thousands of bytes of data depending on the capacity of the chip.

Antenna



Connected to the processor by an external cable or sometimes contained inside the same housing, the antenna transmits the data to and from the tag back through the processor.

Processor



The role of the processor is to organize the data as it is being read or written. The processor is usually connected to a controller, like a PC or PLC, and performs the task issued by the controller.

Common Industrial Applications

Work In Process (WIP)

- Enable flexible manufacturing
- Track the rework process
- Maintain regulatory compliance

Asset Tracking

- Eliminate asset losses
- Increase asset productivity and maximize up time
- Manage maintenance and/or calibration data

Logistics

- Reduce time and potential errors when shipping and receiving components
- Maintain traceability and visibility from sub suppliers to finished products
- Maintain regulatory compliance

E-Kanban

- Reduce levels of in-process inventory
- Implement Just-in-Time inventory flow with outside vendors
- Automatically replenish line parts

Standard Frequencies

Frequency	Strengths	Limitations
Low Frequency (LF) 125kHz	Performs well when mounted on or embedded in metal.	Short read range, typically no greater than a few centimeters (cm). Limited memory capacity.
High Frequency (HF) 13.56MHz	Performs well on metal. Large amounts of data can be read and written to the tag, up to 128KB.	Read/Write range is limited to about .5 meters (m).
Ultra-High Frequency (UHF) 865 - 868 MHz*	Excellent read range, > 3m in some cases. Can read multiple tags at once.	Limited memory capacity, usually 64B. Susceptible to interference from metals and liquids.

*EU Frequency requirement