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# RFID 101

**Radio Frequency Identification** (RFID) technology has been used since the 1940's when the Allied forces in WWII needed to identify incoming aircraft as friend or foe. Since then it has evolved into an effective way to read data in the data collection process including supply chain management, logistics tracking and retail point of sale.

RFID uses radio waves to communicate an identification number between a reader and a tag. This communication occurs through the air and through most materials, except for some liquids and metal. RFID makes it possible for an RFID reader to identify hundreds of items simultaneously.

**An RFID tag** consists of an integrated circuit and an antenna. Tags have many variable characteristics including power requirements, memory capacity and read/write capabilities. Application standards such as those required by ISO and EPCglobal define the characteristics of a tag for an individual application as explained below.

Tags used in RFID applications consist of a chip and an antenna, called the inlay, inserted between the label and the liner to create a "smart label."

**Radio Wave Frequencies** are used to read data from the tag. The types of radio waves that can be used to read RFID tags are Low Frequency (LF), High Frequency (HF), Ultra High Frequency (UHF) and Microwave bands. The advantages to using higher frequency waves are that they have a faster transfer rate and longer read ranges. The disadvantages are that they are more sensitive to environmental factors that can interfere with a good read and the tags are generally more expensive.

Low Frequency tags operate at or near 125 kHz, so the data transfer rate is relatively slow, and they have a short read range of less than half of a meter. These tags are less sensitive to interference and generally less expensive than the higher frequency tags.

High Frequency systems operate at 13.56MHz, so they can transmit data faster than LF tags. The read range for HF systems is about one meter.

Ultra High Frequency systems operate within the range of 860 – 960 MHz depending on the geographic location. The North American market operates at or near 915MHz. Much of Western Europe is at the low end of the spectrum at 868.5 MHz. Several Asian countries recently opened the higher end of the spectrum for RFID usage. Many countries around the world have not yet identified the portion of the UHF band that will be allocated for RFID tracking applications. UHF tags can be read up to ten meters away and generally operate at greater speeds than HF tags. However UHF waves are more susceptible to interference from metal and liquid substances than HF tags.

Microwave Frequency systems operate at or above 1 GHz. Microwave tags can be read up to two and a half meters away with the use of a specially designed antenna. The addition of a battery also increases their read distance. Microwave tags offer the greatest data transfer rate.

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**RFID standards** are being formed by two main groups, ISO and EPCglobal. EPCglobal developed out of a joint venture between EAN/UCC and the AutoID Center that developed the Electronic Product Code (EPC). EPC is part of a system that uses RFID tags, readers, Physical Markup Language and databases for tracking items. The EPC network could eventually allow manufacturers to identify every individual item they produce; every can of soup, every tire, every pair of pants would have a unique identifier. It is debatable whether this level of item identification capability is necessary, but the EPC Network continues to expand the current EAN/UCC capabilities for global identification.

Currently, standards exist for the EPC Network, but it is recognized that these standards are temporary until the final revision is released. Matrics developed the Class 0 standard and originally featured Read Only tags. Alien developed the Class 1 standard and originally featured Write Once, Read Many tags. These companies and many others understand that the final EPC standard, being referred to as Class 1 Generation 2 or Gen 2, requires read/write capabilities in their solutions. The Class 1 Gen 2 standard was finalized in December 2004 and has become a significant player in the industry. A major goal of the Gen 2 standard is to allow for interoperability among reader and tag devices regardless of the reader/tag manufacturer.

While much of the RFID spotlight has been focused on Wal-Mart and the Department of Defense, there are other RFID applications that exist outside the retail supply chain realm. These applications offer the major benefits of RFID to companies that are willing to invest in the technology. Some examples of other applications include library tracking systems, inventory management, baggage handling, rental industry and patient identification and accounting.

There is a lot of momentum surrounding RFID technology because Wal-Mart already requires their top suppliers to incorporate RFID into shipping pallets and the Department of Defense requires all of their suppliers to be RFID compliant. The cost of RFID technology still is prohibitive for smaller companies to implement as RFID tags are much more expensive than regular labels. As interest and standards development increase, RFID could be the next compliance labeling initiative for supply chain management operations.

**Tharo Systems Inc**., the author of EASYLABEL software, understands the growing need to conform to RFID standards. EASYLABEL 5 features RFID capabilities to correctly program and print RFID tags with your RFID capable printer. EASYLABEL 5 also features an RFID Wizard which makes creating a compliant RFID tag child's play. Data can be entered by the user or imported from an external database or other sources.

A report containing the data used to program the RFID tag also can be created and then used as part of an Advanced Shipping Notice to keep a record of labeled items or other company needs.

Feel free to download a demo copy of EASYLABEL 5 from the download page or our website at www.tharo.com