

RFID Technology Series

EXECUTIVE SUMARY RFID Hardware: What You Must Know

Understanding and Selecting RFID Devices

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May 2006

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About ChainLink Research

ChainLink Research, Inc. is a Supply Chain research organization dedicated to helping executives improve business performance and competitiveness through an understanding of real-world implications, obstacles and results for supply-chain practices, processes, and technologies. The ChainLink Inter-Enterprise Model is the basis for our research; a unique, real-world framework that describes the multidimensional aspect of links between supply chain partners.

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It is the business of the future to be dangerous... The major advances in civilization are processes that all but wreck the societies in which they occur.

Alfred North Whitehead

Other RFID Reports:

RFID Software—Middleware, Networks and Applications

RFID Service Providers

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RFID Mini Reports

RFID in Manufacturing

RFID for the Customer Experience

Value Consideration for RFID- Mini Report

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Executive Summary

RFID has hit the world like lightening! But the fact is that there is little understanding of how the technology works, or how to select solutions. Even firms under mandates to implement RFID understand very little about how to get the most value for their own firm. Through a series of RFID reports, ChainLink Research will address these issues.

WHAT YOU WILL LEARN IN THIS REPORT

This report—*RFID Hardware*—is for two audiences. There is a primer for those who have little or no RFID knowledge. We use the word primer, but it is comprehensive enough that we think most people will still learn more about RFID, even if they are not beginners. Although many people have already gained experience implementing RFID, there are still many folks in the vendor community with light expertise, as well.

The second audience is those who are seeking knowledge about the players in the market. Though RFID is new in some applications, there are hundreds of RFID companies out there. It is hard for end-users to sort out the real players.¹

We at ChainLink Research have spent the last few years learning about RFID. Prior to the RFID Era, we were working in warehouses and ocean ports, putting in bar-coding, mobility systems, real-time locating systems, warehousing systems, and retail in-store operations systems. We were researching this emerging technology from many vantage points. We found that even though there is a plethora of information out there, there are very few good approaches to learning and implementing this new technology. So we developed one. Through this and the subsequent reports on RFID, we will provide you with the basic background information you should know to be able to select the right RFID solution for your business.²

We have lots of graphics, charts and definitions to help you understand RFID, and we have several views from the solution providers to help you decide what is right for you.

This report is not intended to place a value judgment on the solution providers. There are too many variables in each project situation to make that statement in a report. But the report will *guide you* in your discussions with these firms, as well as help you think about your RFID requirements before you go shopping.

¹ In table 1 only firms with validated case studies were considered in this report.

² Courses in RFID basics are available through RFID Technical Institute at rfidtech.com at DeVry University, University of Texas at Dallas (UTD).

RFID Tag/Transponder	A microchip attached to an antenna (there are also chipless tags) that picks up signals from and sends signals to a reader. From one-bit tags to data-rich tags, these can store data ,such as unique serial numbers, location information, and many other types of data.
Antenna	The antenna is the conductive element that converts RF into electri- cal energy and vice versa, thereby enabling the tag or reader to send and receive data wirelessly. Antennas can be wire, an etched conduc- tive pattern affixed to a plastic substrate, or conductive inks made from aluminum, copper or silver.
Reader / Interrogator/Encoder	The reader (also called an interrogator) communicates with the RFID tag via radio waves, reading (interrogator) as well as writing information (encoder) to and from the tag. A reader may store the data and/ or pass the information in digital form over a network or directly to another device. Readers may also receive data from other sensory devices (e.g. motion detector) and/or they may control other devices (such as indicator lights).
Active Tag	An RFID tag that contains its own power source. It's power source is used to power the microchip to receive any transmit data. The use of a battery substantially increases the large of the signal, compared with a passive ag
Passive Tag NPLE PA	Final of the second solely by the RF energy emitted by the reader device. The passive tag uses this energy to power the micro- chip and transmit data back to the reader.

RFID HARDWARE COMPONENTS

RFID TAGS



RFID tags are small electronic circuits. Most tags are constructed of a silicon microchip attached to a metallic antenna. The microchip on the tag contains data. The size and type of data stored can vary depending on the particular application. In some applications, the data is comprised of a unique serial number plus additional space to store application-specific information. It can be a read/write tag that can store data, or it can be factory-programmed with read-only information. The attached antenna allows the data contained on the microchip to be sent to and from a reader device. The explosion of available tags in the market is mind-bending in terms of the increased diversity of tags, as well as the sheer numbers of tags.

Understanding the Technology - The Science of RFID

Now let's begin at the beginning and really understand the properties of this astounding phenomenon of nature! You may wonder why you need to learn about science in making business decisions, but your effort to understand a bit about the science of RFID will help you tremendously in making technology and applications decisions, as well as in being able to have intelligent conversations with your vendors. This will directly correlate to the success and ultimate value you derive from your RFID initiatives.

BASIC SCIENCE

Don't get thrown off by the word science. You will not need a Physics or Electrical Engineering degree to understand this. In fact, you *should* learn this, and not rely on your resident geek. Besides, this will explain many of the applications of this science you may already use in your day-to-day life. Most implementations happen away from the EE contingent and once installed, the average professional (warehouse worker, nurse and doctor, store sales staff) will be expected to operate this, so learning is key.

The Electromagnetic Spectrum

First, a basic understanding of electromagnetism. Electromagnetic words by a both an electrical field and a magnetic field within the wave. There are many of formagnetic wavelengths and frequencies that exist on the earth and many we can harness for communications (and identification randows).



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