



Ideal Applications for RFID in Retail Distribution Centers

With proper application of the right technology, retailers can benefit from efficient, cost-effective solutions for data collection.



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Used as a stand-alone or as a complementary technology to laser- and camera-based data capture, Radio-Frequency Identification technologies such as passive UHF offer an increasingly affordable and automated means to improve inventory accuracy and omni-channel fulfillment execution.

Thoughtful application of these technologies to increase supply chain transparency may also provide a strategic gateway to enhance the customer's purchasing experience.

In the dozen years since retail goliath Walmart announced a supply chain initiative requiring its top 100 suppliers to tag pallets and cases of goods with radio-frequency identification (RFID) tags, the technology has seen its share of ups and downs.

Once considered as an alternative to laser- and camera-based automatic identification and data capture (AIDC) technologies that capture and read bar codes, the cost of RFID implementation far outweighed the benefits for most retailers. Establishing a new RFID paradigm was found to be expensive and risky and thus, difficult to justify the return on investment (ROI). In addition, the tags themselves ranged in price from \$0.50 to \$1.00 (or more) at the time. Meanwhile, bar codes had become ubiquitous throughout the supply chain—as had the scanners that read them. A decade ago, it simply didn't make financial sense for most retailers to implement RFID.

Today, the situation has changed considerably. More and more retailers are recognizing the benefits of RFID as the technology continues to see significant improvement from the standpoints of performance and economics. The tagging of individual items (in addition to the tagging of pallets and cases) as a complementary AIDC technology to laser scanners and camera-based image readers adds a whole new layer of information encoded into and travelling with the item in real time. This validation of worthiness comes in part because the cost of RFID tags has dropped to less than \$0.10 apiece, and the performance and reliability of the systems has, at the same time, improved substantially. RFID's



selective rise in retail implementations can largely be attributed to its tremendous enhancement of real-time inventory visibility, improvement in accuracy of inventory, and reduction in time spent and errors made in inventory workflows.

By implementing RFID as part of a multi-modal AIDC solution—including the laser and camera systems deployed throughout a retailer's supply chain infrastructure—today's retailers can attain the highest levels of inventory accuracy. It's that high level of visibility and accuracy that makes omni-channel fulfillment successful. With proper coordination and

design (both hardware and software) from the individual read points all the way up to the enterprise level, RFID technologies enable time-critical fulfillment of orders from different sales channels (retail stores, resellers and individual e-commerce customers) through multiple outlets, including store locations and distribution centers (DCs).

This white paper focuses on the points within a retail supply chain where RFID offers the greatest benefits and maximum return on investment.

RFID: An Overview

First, a look at how RFID technology works:

Unlike laser scanners and camera-based omni-directional code readers, RFID does not use an integrated light to decode data encoded into a printed code pattern. Instead, RFID employs tags at the item level with an Electronic Product Code (EPC) that contains both product information and serialization data. The EPC is embedded in a very tiny microchip attached to a small antenna and adhered to a paper tag.



Tags can be active, passive or battery-assisted passive (BAP). Active tags house an on-board battery that allows them to periodically transmit a signal (this makes them the most expensive type of tag and requires maintenance). Passive tags (the least expensive and smallest) do not contain a battery, instead using the radio energy transmitted by the tag reader or “interrogator.” BAP tags have a small battery that is only activated by the presence of a reader thereby extending battery life and increasing sensing range (several tens of meters instead of meters).

Two-way RFID readers, or interrogators, wirelessly transmit a high frequency (HF) or an ultra-high frequency (UHF) radio signal that encodes and decodes tag data. Because it relies on radio frequency technology, RFID does not require direct line-of-sight or close proximity to read the tag’s EPC. It can also identify multiple-objects simultaneously in a single read many times in just a few 10s of milliseconds.

In addition to the decreasing price of both tags and readers, the technical limitations that previously hindered RFID installations—such as interference caused by environmental metal, false reads, and proximity-miss assignment errors—have been greatly improved with new solutions and designs entering the market.



Ideal Applications for RFID in Retail Supply Chains

With RFID technology in place throughout a retailer’s supply chain, items can be efficiently identified, located and delivered to a customer with an enhanced level of automation, ensuring less manual data input and faster tracking processes. When properly thought out and applied, RFID can replace bar codes. However, in today’s environment, based on existing infrastructure and technologies, hybrid systems, with both bar codes and RF tags exist, and the technologies complement one another. By providing an additional layer of item-level AIDC in real-time, RFID technologies can pay for themselves in

increased efficiencies and smoother operations. Globally standardized data structures enable the application of sophisticated encoding schemes allowing in-depth descriptive information about the article to be carried on the item itself. Counterfeiting can also be caught before it's too late.

- **Outbound Shipping (from Suppliers) / Inbound Receipt (at the DC):** RFID enables fast, accurate verification of pallet loads of case-packed inventory without opening the box. When added to a fully-automated shipping operation that already deploys laser- or camera-based AIDC, a so-called “hybrid” RFID system can be created, further enhancing the accuracy and thus the performance of a multi-sided (up to six sides) scan tunnel.



Depending on the quality and types of case-level bar codes and their placement, an application might utilize both laser scanners and cameras to quickly identify and route product to its next destination (storage, forward picking, cross-docking and more). Adding strategically placed RFID antennas and using best practices for tagging allows the data from individually tagged items within the cartons to be captured and verified without an associate's intervention or direct line-of-sight. The upper level “enterprise software” is relied upon to create the workflows and cross checks needed to validate the performance and ensure operational excellence.

- **Inbound Receipt at Stores:** Store-level receiving personnel equipped with hand-held RFID readers can be instantly alerted about which items should be placed on the floor immediately and which can be held back. Likewise, with more retailers offering ship-to-store items for customer pick up, the same system can highlight which products should be held at customer service.
- **Buying Pattern Analyses at Stores:** At the store level, merchandise with RFID tags can be tracked to answer a variety of questions. Do items in a specific location sell faster than others? Are items brought to the dressing room purchased or returned to the rack? Data from the in-store point-of-sale system doesn't really tell the complete story regarding buying patterns. The data from strategically placed, non-intrusive, RFID systems can be used and analyzed for better insight into shoppers' preferences and purchases. Thoughtfully developed data structured into the tag can be used to decipher the “four Ws:” What (is it), Where (is it), When (what time is it), and Why (what is the shopper doing with the product)?
- **Loss Detection and Prevention at Stores:** Along the same lines, software that connects RFID-tagged product movement to in-store closed-circuit television cameras can help store management observe what happens when an item is stolen. Analysis of these actions can help retailers develop new methods to reduce inventory shrinkage.

Benefits of RFID-based AIDC

As a complementary technology to laser- and camera-based AIDC technologies, RFID offers retailers a variety of benefits.

1. **Better Inventory Accuracy:** Most retailers concede that in-store inventory accuracy hovers around 65%, according to an article in the [RFID Journal](#). That's because prior to RFID tagging of individual items there was no easy way to capture timely information efficiently about what merchandise was in a store, and where. However, by implementing item-level RFID tagging, retailers can benefit from in-store inventory accuracy as high as 95%, as stated in the [RFID Journal](#). This heightened level of accuracy and data visibility enables omni-channel retail fulfillment, because the technology allows retailers to determine where required items are and select the best channel (store or DC) to fill the order.
2. **Reduced Handling:** In facilities that add RFID to image- and camera-based AIDC, associates no longer have to open every single box to document inventory. Following best practice guidelines for tagging and packaging individually tagged items, direct line-of-sight is not necessary for RFID. In this way the automatic creation of accurate item counts with minimal operator handling is possible. This means unloading an inbound trailer or container can take a fraction of the time previously required for operators to individually scan, sort and count cartons—and their contents. Likewise, cycle counting can be conducted instantaneously in real-time without human intervention. Reducing inventory touch-points frees up associates for other tasks.

3. **Instant Item Location:** Utilizing RFID readers, retail DCs and stores can immediately gather real-time identification about tagged items and their locations within the four walls. In the warehouse, this can facilitate faster picking because pickers can find required items more quickly. When connected to web-based software, the same information gives retailers better visibility of inventory and the ability to make timely decisions about its management, including (for example) determining in-store item popularity by geographic region, and scheduling timely replenishments accordingly.



4. **Fewer Out-of-Stocks:** Thanks to the ease with which RFID-tagged items can be located in-store, retailers have access to real-time inventory location and quantity information. For omni-channel retailers this data ensures that in-store inventory information is as up-to-date as possible. In effect, this eliminates the possibility of a customer arriving at a store and then learning that the item is not available after all.
5. **Less Shrinkage:** Because RFID enables daily in-store inventory counts, retailers can more easily pinpoint when an item disappeared. In an article in the [RFID Journal](#), it claims that more than 40% of retail shrinkage is attributed to employee theft, and implementing item-level RFID tagging dissuades less-than-honest workers from stealing merchandise. Further, by integrating

RFID with POS and other surveillance systems, retailers can quickly identify which items left a store without being purchased.

Summary

Although not currently as prevalent as laser- and camera-based AIDC solutions, RFID technology offers a long list of proven benefits to retailers seeking to enhance their supply chain. Using RFID technology enables retailers to improve the efficiency of receiving processes, increase inventory accuracy, enable real-time visibility, and monitor shrinkage more closely throughout their operations. Further, the tremendous boost in visibility yielded by RFID is crucial for enabling retailers to deliver enhanced customer experiences for competitive advantage in the omni-channel environment.

Through proper application of the right technology in the appropriate areas of their supply chains, retailers can benefit from efficient, cost-effective solutions to their data collection. Partnering with a strong AIDC vendor—one that offers a full solution portfolio of diverse, complementary technologies that can be applied in a multi-modal approach as needed—will benefit data capture technology evaluation and the selection process. In addition, it will produce the ideal solution for operations while providing needed flexibility for the future.

Need more insights into how to select the right automatic identification technology for your retail DC and handling application? Email or call your SICK Sales Representative, or contact John Ashodian at john.ashodian@sick.com.

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