Intermec

White
Paper

THE WRITE STUFF: UNDERSTANDING THE VALUE OF READ/WRITE RFID FUNCTIONALITY

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INTRODUCTION

Radio frequency identification (RFID) technology is attracting considerable attention as a complement or even replacement for bar code because of the significant range, speed and unattended reading advantages it provides. However, users should expect more than improved reading before investing in an RFID system. RFID has read/write ability, and users can unlock the full value and benefits of the technology by taking advantage of the ability to add and change data on the tag in real time. Read/write RFID creates many new applications in the supply chain and helps accommodate changes in business processes, customer requirements or standards.

When RFID is viewed as a straight replacement for bar code, the RFID tag cost must be very comparable to bar code label cost, since the tag is being asked to provide essentially the same functionality. Read-only tags are suitable for these limited applications. Potential users often erroneously assume that read/write tags are too expensive and overlook the additional benefits only available from tags that can be written to and rewritten.

The price difference between read-only and read/write tags is actually very small, and is often offset by total cost of ownership (TCO) advantages that read/write tags provide. The real payback with RFID is its proven ability to reduce "operator required" action. Read/write tags provide many more opportunities to reduce operator involvement and gain more from the RFID investment.

This white paper will:

- Describe the capabilities of read/write RFID technology;
- Explain how read/write technology overcomes the limitations of read-only systems; and
- Explain how specific supply chain applications can benefit from the ability to write and rewrite data to tags.

WHAT IS RFID?

An RFID system typically includes the following components:

- A tag or label that is embedded with a single chip processor and an antenna. The tag is an extension of the bar code labels you see in stores today, but with more intelligence.
- Tags may be read-only or read/write. Read-only tags are most like bar codes because the encoded data cannot be changed and is often only a serial number that is used to retrieve additional descriptive data (such as item type, date of manufacture, etc.) from a database. Read/write tags function like computer disks because they can be rewritten and updated an unlimited number of times, and may offer "locked" sections that cannot be altered.
- A radio enabled device that communicates with or interrogates the tag for reading and writing.

Various types of tags and labels are available for use in different environmental conditions. Readers, often referred to as "interrogators," can be either fixed-position or portable, just like bar code scanners. "Passive" tags, the type of tags commonly used in supply chain systems, pick up enough energy from the radio to operate and to communicate back to the radio. "Active" tags have an embedded battery and offer the advantage of longer-range communications.

An RFID system's "read range" — the distance an interrogator must be from the tag in order to read the information stored on its computer chip — varies from a few centimeters to tens of meters, depending on frequency used, whether a tag is active or passive, and how directional the antenna is on the interrogator. For read/write tags, the read range is typically greater than the write range.

Unlike bar code-based tracking systems, an RFID system can read the information on multiple tags without necessarily requiring line of sight and without the need for a particular orientation. That means RFID systems can be largely automated, greatly reducing the need for manual scanning. In addition, RFID tags hold much more data than U.P.C. symbols. The tag can be programmed to hold information such as an item's serial number, color, size, manufacture date and current price, as well as a list of all distribution points the item touched before arriving at a store.

READ/WRITE ADVANTAGES

With the ability to write comes the ability to change. This is a very important feature in the unsettled world of RFID. Business operations, information needs, standards, customer requirements and other variables can all change over time. Read-only RFID tags cannot. Once the tag is programmed, the data cannot be altered for the life of the tag.

Several national and international standards have been ratified for RFID item management, including the U.S. national standard for shipping container identification, ANSI MH10.8.4. Proposed standards, including the internationally recognized ISO/IEC 18000 series, are expected to receive full approval in the near future. There are also several major proprietary, non-standard initiatives underway to specify how RFID can be used to mark consumer goods. One such effort is the Electronic Product Code (ePC) system that has been devised and promoted by the Auto-ID Center at MIT. Some leading retailers and manufacturers are also creating their own specifications that their suppliers must comply with, and like the ePC system, these initiatives are not standardized and may be based on proprietary technology. Today, we don't know which, if any, of these specifications will gain widespread use or become a de facto standard. It is possible that another, unforeseen RFID format could emerge and dominate a market, as the U.P.C. symbol did in retail.

With read/write RFID technology, users are in control of their applications and their technology investments. When customer requirements, application needs or standards change, users can change along while preserving their initial technology investment. For example, suppose a retailer required suppliers to identify their pallets with a 10-digit serial number, then changed its requirement to a 12-digit number, or an alphanumeric string. Suppliers using read/write tags could comply with the new requirement with minimal cost or disruption to business by writing the new information to their existing pallets. Suppliers using read-only would have to purchase new tags for each pallet, apply them and remove the old tags to ensure they wouldn't be read by the retailer. Any initial cost savings gained by the initial purchase of read-only tags would be dwarfed by the materials and labor costs required to refit the pallets.

Read/write tags can also provide specific performance advantages, especially in applications that require the high-speed, unattended processing that RFID provides. The data in read-only tags usually functions like a license plate—it uniquely identifies the object and serves as a pointer to more specific information stored in a database. The RFID system may boast an impressive read rate of several dozen tags per second, but in a real-world scenario the processing speed is limited and dependent on the network and database. When the tag is read, the reader sends a message over the network to perform a database lookup to obtain specific item information necessary to complete the transaction. These databases can become quite large and expensive to maintain and may require processing fees for the transfer of information from one point in a supply chain to the next.

The database dependence of read-only tags could prove to be a major hindrance in high-volume, multi-company supply chain applications. Manufacturers, their raw materials suppliers, logistics providers and retailers all need access to the same database to optimize their supply chain interactions. This scenario leads to questions and possible disputes over who "owns" the database, where it should reside, the maintenance responsibilities for each participant, security and access privileges, and synchronization issues. One proposed read-only RFID supply chain system has earmarked the Internet as the ideal medium to exchange tag information. While the Internet is widely accessible, its ability to process and report millions of tag readings and communicate them in real time is unproven; its ability to perform these functions at speeds that approach RFID read rates is extremely unlikely.

Read/write tags can have more information stored locally on the tag, which enables faster processing, reduces data latency and may not require a database lookup or any contact with an external system. Read/write systems allow the information contained on the tag to be edited, amended or locked, capabilities that are particularly valuable when dealing with high-end inventory tracking and other applications when complete, up-to-date information (such as current pricing) is of particular benefit.

Tags may also be completely erased and reused. When a particular item no longer needs to be tracked, the RFID tag may be removed and reapplied to a new item. Tags can be reused hundreds of times, which reduces the amount of new tags that need to be purchased, fully leverages the initial tag cost, and provides significant total cost of ownership advantages over inflexible, disposable read-only tags.

For current bar code users who print bar code labels with variable information on demand, read/write tags are the only RFID technology that provides the flexibility and control to which they are accustomed. Read/write RFID provides real-time control and long-term system protection.

RFID provides the ability for high-speed, unattended reading of multiple tags. Tags have the ability to respond selectively based on the request of the interrrogator. This has the affect of doing a group select on the tags, so that only the items you're interested in will respond. This is very advantageous for cross docking and other shipping & receiving applications. This enables products to be redistributed efficiently in a cross-dock environment by quickly locating incoming items that are needed to complete shipments.

APPLICATIONS

Read/write RFID can do everything read-only technology can do, and more. This makes the technology appropriate for more applications, and enables it to deliver more value to trading partners. Read/write is especially valuable for supply chain applications, where each trading partner may refer to the same identification information on the tag but also write to and utilize other fields to support their own specific applications and business requirements. The following brief examples highlight the advantages available by being able to write data to update tags.

SHIPPING & RECEIVING

Advance ship notices (ASN, the EDI 856 transaction) were created to streamline shipping and receiving operations, but they are a consistent cause of bottlenecks because physical shipments often arrive before the ASN and can't be unloaded or processed until the electronic record arrives. RFID tags used to identify pallets and shipments can include standard identification information, and can also be encoded with the ASN data just prior to dispatch. At the receiving dock, ASN information could be obtained from the RFID tag, eliminating the need to stage materials and delay processing. This capability is especially valuable in high-speed, cross-dock environments.

Distribution

Because no dominant standards are in place governing RFID identification of products or shipments, companies may very well find themselves in the position of having to satisfy different RFID labeling requirements for different customers. This scenario would place a large burden on distributors, who handle thousands of individual items for hundreds of customers. Read/write technology simplifies the task of meeting different customer requirements by enabling manufacturers and distributors to custom encode tags immediately before shipment to customers, rather than by maintaining and managing separate tag inventories.

Distributors could also take advantage of read/write functionality to encode their own part or kit numbers on products, instead of relying on a database lookup to cross-reference and reconcile their specific identification system with the manufacturer's.

Returns & Recall Management

Companies could supplement the basic shipment identification information by writing the specific customer and time of shipment to the tag immediately prior to distribution. Producing and recording this information would provide several benefits. In the event of a recall, companies could trace specific shipments to specific customers, which would enable a highly targeted notification and return operation and avoid a costly general recall. For general returns, companies could verify that the customer returning merchandise is actually the customer who received it, which would deter diversion, counterfeiting and other forms of return fraud.

Service and Warranty Authorizations

Authenticating the product and customer with proprietary information could also be used to authorize warranty and service work. Upon completion of repairs or service, a record of the activity performed could be encoded on the tag to provide a complete maintenance history that travels with the item. If future repairs or service are required, a technician could access the item's complete maintenance and configuration information without accessing a database simply by reading the tag. This application ensures workers have necessary information if no database access is available, and eliminates the need and expense of making phone calls or wireless data inquiries to access records.

Regulatory Compliance

Companies that transport or process hazardous materials, controlled substances and other regulated materials could record the time they received and transferred the material on an RFID tag that travels with the material. Updating the tag with real-time handling data creates a chain-of-custody record that could be used to satisfy FDA, DOT, OSHA and other regulatory reporting requirements.

These are just a few of the many possible uses of read/write RFID technology. Virtually any business process where users need to access information, or where information may change, is a candidate for automation with read/write RFID.

CONCLUSION

We know RFID technology and its uses will continue to change, but we don't know exactly how. Read/write technology can meet sophisticated application needs today but also provides the flexibility to accommodate future changes. This flexibility enables users to fully leverage their RFID investment by adapting the technology to meet future needs and extend the life cycle of the system.

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611436-01A 6/03