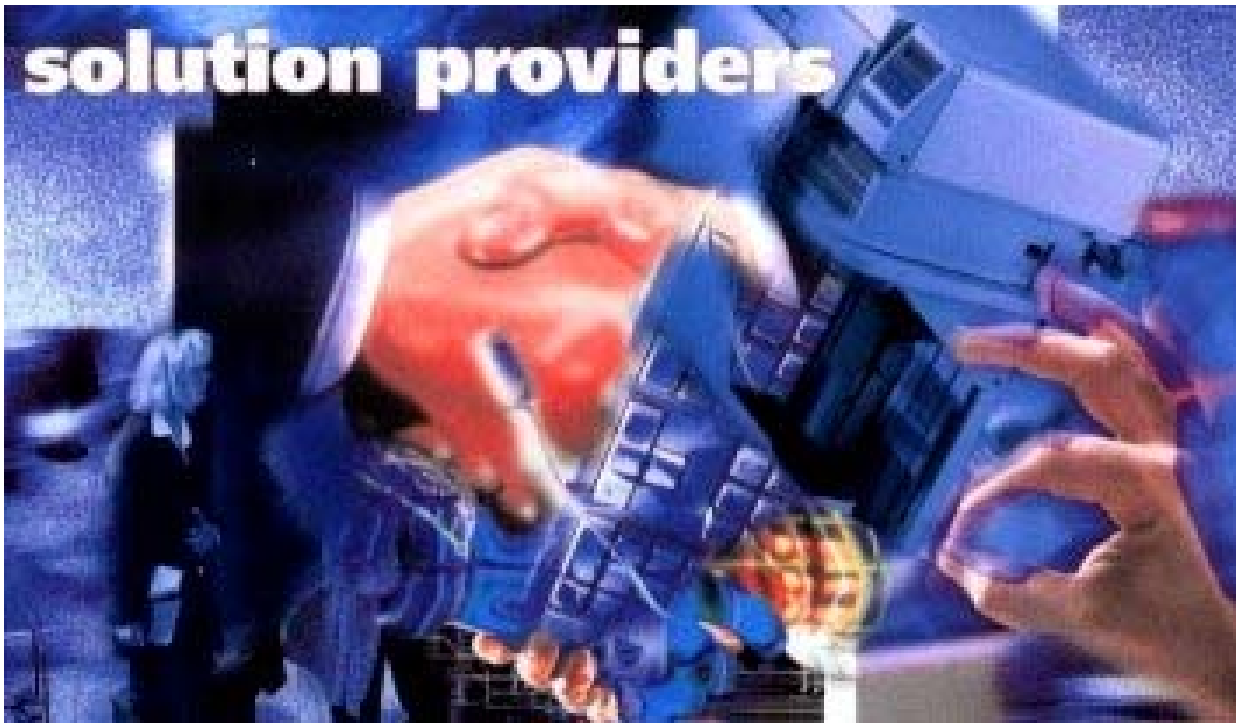
RFID SOLUTION PROVIDERS



Radio frequency identification

Radio frequency identification (RFID) is becoming increasingly popular as a complement to bar coding or as a stand-alone solution. RFID's flexibility, batch read capabilities, rewrite functionality and durability provide added value to users who are facing tough automatic identification and data collection (AIDC) challenges. Newbury Data offers RFID capabilities to users in a variety of industries, including manufacturing, healthcare, hospitality, retail, security, and warehousing.

Technology

In the simplest terms an RFID system consists of a tag (transponder) and a reader (interrogator). The technology of RFID deals with the remote collection of information stored on a tag using radio frequency communications. Information stored on the tag can range from as little as an identification number, to kilo-bytes of data written to and read from the tag, to dynamic information maintained on the tag, such as temperature histories. The information from the tag/reader combination is either presented to a human operator typically using a hand-held device with a alpha-numeric display or a host computer which automatically manages the information. Critical performance variables in an RFID system involve the range at which communication can be maintained, the size of the information space contained on the tag, the rate at which the communication with the tag can take place, the physical size of the tag, the ability of the system to "simultaneously" communicate with multiple tags, and the robustness of the communication with respect to interference due to material in the path between the reader and the tag. Several factors determine the level of performance that can be achieved in these variables. The factors include the legal/regulatory emission levels allowed in the country of use, whether or not a battery is included in the tag to assist its communication back to the reader, and the frequency of the RF carrier used to transport the information between the tag and the reader.

Frequency

Over the course of decades of RFID development, industry has evolved RFID solutions that variously trade the regulatory constraints, the signal propagation characteristics of various RF carrier frequencies, and the economics of tag size and optional batteries. These solutions employ only a few RF frequencies around which the vast majority of RFID systems are fielded today. The RF frequencies include relatively narrow bands centred at:

- 125/134KHz or low frequency (LF)
- 13.56MHz or high frequency (HF)
- 433/869/915MHz or ultra-high frequency (UHF)
- 2.45/5.8GHz or micro-wave (uW)

These frequency values are commonly refer to the RFID technology. Thus, tags and readers combinations are described as employing LF, HF, UHF, or uW technology.

Passive/Active Tags

Within any one technology there is a wide range of tag performance reflecting semiconductor chip performance, tag antenna size and efficiency, and whether a battery is included in the tag. There are two broad classes of tags with respect to the source of energy used to power the tags: passive tags or those that receive their energy solely from the RF field supplied by the reader, or active tags that have a battery to boost the read range of the tag.

Read Range

In many cases there is a sharp delineation between the read range of two classes of tags employing passive technology, those that have a relatively short read range and those that have a relatively long read range, especially at LF and HF. Like many radio systems, short-range RFID systems tend to be less expensive and relatively easy to design and build. Long-range RFID systems tend to be more expensive and difficult to build. Typically, the range performance of RFID systems is determined to a major extent by the reader, the power of the signal it radiates and the sensitivity of its receiver.

Anti-Collision

In many applications it is desirable to communicate with a tag when other similar tags are simultaneously visible to the reader. In the case of tagging pallets, it is unlikely two pallets will need to be in the read space at the same time. In the case of library books an important design feature is the ability to read and "check-out" multiple books as the same time. The ability of the tag/reader system to talk unambiguously with one tag at a time is determined by the anti-collision algorithm used to identify each tag and establish a communication session with the tag.

Tag/Reader Communication Protocols

The original designer of the semiconductor device in the tag has historically determined how information is communicated to and from the tag. These protocols vary widely in the ways the carrier is modulated, the data is encoded, read/write/verify commands are structured, how multiple tags are read without interfering with one another, and whether privacy/security services are provided. These varying protocols have relative advantages and disadvantages, depending upon the application being considered.

Standards

Over time RFID manufacturers and users have typically concluded that while there are advantages to having several communication protocols from which to choose for any application, there would at each frequency be an advantage to settling on one protocol, or at most a couple of protocols, which multiple suppliers could offer chips and readers. The appearance of these standards is relatively recent and reflects the work of industry bodies including the UCC and the EAN, the International Standard Organisation ISO, and national bodies like ANSI in the U.S. Many of these standards are new or are in the process of being defined and there is considerable uncertainty what their form will ultimately be.

Summary

The RFID industry today represents a dynamic attempt by manufacturers and users to build and deploy solutions reflecting trade-offs between a wide range of technical, political, and regulatory constraints. It is in this dynamic environment that Newbury Data provides RFID printers and readers which enable end-users, system integrators, and automatic data capture (ADC) equipment suppliers to make timely and safe decisions about how to employ RFID.

RFID readers

An RFID reader comprises an antenna and a controller. The controller codes, decodes, checks and stores the data, manages communications with the tags and communicates with the host. Strictly speaking a "reader" only reads data from the tags where as an "interrogator" reads data from the tags and writes data to them. The reader and tag communicate wirelessly across what is known as the air-interface. The information is then passed from the reader to the host system. In the case of read/write systems information can be passed back through the system from the host to the reader over the air-interface and stored in the memory of the tag.

RFID tags

Like a bar code or an electronic data interchange (EDI) network, an RF tag is a data carrier. A bar code carries data in a visible symbol and is read at optical or infrared wavelengths; an RFID device (or tag) carries data programmed into a chip and operates at a wide range of radio frequencies. Essentially all tags comprise a semi-conductor chip with memory, processing capability and a transmitter connected to an antenna (aerial). Memory can vary with simple tags having a small amount of fixed memory (c 64-128 bytes) and more complex tags ranging up to 64 kilobytes

Passive and active tags

Some tags have onboard batteries to increase range, and are known as active tags. These tags are more expensive, and only used for specific applications. The great majority of tags in supply chain management will be passive, taking their energy from the electromagnetic field emitted by the reader.

Read only and read/write tags

The information on read only tags cannot be changed. A suitable interrogator can change the information in read/write tags.

Advantages of RFID technology: As RFID uses radio waves it can do things that optical technologies cannot do. Key advantages include:

- **Line of sight:** Tags can be read without being physically seen as long as they pass through the electromagnetic field emitted by the reader
- **Range:** Tags can be read at very long range; many hundreds of metres in the case of very specialised tags. RFID devices used in mass logistic applications need a range of a least a metre and up to 4 or 5 metres. Write range is generally much less than read range
- **Bulk Read:** Many tags can be read in a short space of time, typically hundreds of tags per second
- **Selectivity:** Potentially, specific data can be extracted and read from a specific tag
- **Durability:** Tags can be weather and tamper proof
- **Read/write (RW):** Data tags can be updated to accommodate simple change in status (eg. 'paid for' or 'not paid for' in retail electronic article surveillance tags) or more complicated information such as a car's warranty and service history

Limitations of RFID technology: Your business requirements will determine whether RFID tags are a viable option. The following points list several limitations associated with the technology.

- **Cost:** RFID tags will always be more expensive than bar codes, however they are able to deliver more benefits in some applications
- **Moisture:** Depending on the technology used, radio waves may be absorbed by moisture in the product or the environment
- **Metal:** Radio waves are generally reflected by metal. This means that tags can be hidden by metal in the environment or their signal may be attenuated
- **Electrical interference:** Electronic noise (eg. Fluorescent light or electric motors) can sometimes interfere with radio frequency communications
- **Accuracy:** It can be difficult to identify and read a specific tag from all the others that are within the range of a reader. For example when reading the tag on a pallet the reader may also read the tags on all the packs on the pallet too. Failure to read a tag is not picked up by the reader
- **Over compensation:** Storing a lot of data on a tag may be useful, however this will increase both the cost of the tag and the time required to read it. Often, a simple identity number is sufficient
- **Security:** Being able to update the tag is useful, but ensuring that the update has been done correctly and by an authorised party is important

Electronic Product Code (EPC)

The Electronic Product Code (EPC) is a new product numbering standard under development by the Uniform Code Council (UCC) that can be used to identify a variety of items using radio frequency identification (RFID) technology. The 96-bit EPC code links to an online database, providing a secure way of sharing product-specific information along the supply chain.

Like other RFID solutions, the EPC's ability to be read without a line-of-sight offer users significant timesaving. This is further enhanced by the ability to update information automatically to the EPC's online database -- identifying where and when a case or pallet of goods arrived, for example -- in supply chain logistics applications.

The EPC technology, in conjunction with the expanding production of RFID capable printers/encoders, has the potential to revolutionise the supply chain by providing more accurate information about product movement, stock rotation, inventory levels and other management information. It also would be a significant tool for product recalls and theft prevention.

RFID Applications

RFID provides quick, flexible, and reliable electronic means to detect, identify, track, and manage a variety of items. The technology is well suited for many operations in all types of industries—provided that users develop new business processes to take advantage of RFID's special abilities. Merely substituting RFID for bar coding will not give users all the benefits that the technology could provide. Many potential users of RFID technology try to make comparisons between the relative cost of RFID and bar code, when comprehensive business process return on investment (ROI) analyses should be conducted. In recent years, interoperable products have emerged, helped by renewed standards efforts by EPCglobal and other standards bodies. In addition, major systems integrators have introduced RFID offerings and products that can make the adoption of RFID, especially in the enterprise, more straightforward as they build on existing and familiar systems. These efforts have enabled many companies to implement RFID pilots in their organisations and begin to calculate the ROI this technology can bring to their operations. The following brief examples show how RFID can improve efficiency and save money in different industries and applications.

Manufacturing

Manufacturers can take advantage of smart labels for work-in-process and lifetime tracking, materials management, inventory control, equipment service and maintenance, and more. RFID tags can withstand exposure to heat, moisture, solvents, abrasives, and other conditions that impair bar code performance in industrial environments, so the technology provides a way to gain new visibility into manufacturing operations. By creating processes to take advantage of the visibility that RFID can provide, manufacturers can reduce their inventory holdings between 10 percent and 30 percent and produce associated benefits related to reduced out-of stocks, improved asset utilisation, and reduced working capital requirements according to Accenture.

Consider how RFID could improve raw materials management. Pallets of goods arrive at the dock door where stationary readers pick up information about the nature of the items and which supplier sent them. In a just-in time environment, the reader could trigger an alert that needed materials have arrived and direct a forklift operator to deliver the materials to a workstation. A forklift-mounted reader would record receipt of the materials and a reader at the workstation would record delivery there. Alternatively, tagged items could automatically be directed through a conveyor system for delivery with no labour intervention. Inventory records would be automatically updated with each transaction. Parts bins can be managed in a similar manner.

Smart labels applied to subassemblies and components automate accurate work-in-process tracking and could be used for lifetime product identification, which would be useful for return, service, and warranty operations. Smart labels have enough memory to store configuration information in addition to a unique identifier. As part of quality control prior to final assembly or packaging, products could be read to verify that all the required components in the proper configuration are present inside the assembly. The process could avoid rework and could be completed more quickly than manual testing and inspection. Unattended, high-speed reading makes it practical to validate every assembly, rather than to spot check.

Product Security

A smart label can provide secure, lifetime tracking that can facilitate accurate warranty and returns authorisation and anti-counterfeiting protection. In 2004, the U.S. Food and Drug Administration (FDA) Anti Counterfeiting Task Force recommended wide-scale adoption of RFID to stop counterfeiting, which now accounts for between six percent and 10 percent of all pharmaceuticals world-wide. The task force report, which earned widespread industry support, singles out RFID as the "most promising" tool to combat counterfeiting. For more information about how RFID can be used to protect pharmaceuticals, see Zebra's white paper, "Track and Trace Solutions for the Life Sciences Supply Chain." RFID systems and business processes to prevent counterfeiting, provide brand protection, and improve channel integrity can be adopted for use in many industries. Zebra's white paper, "Brand Protection in the Supply Chain: Protecting Products and Profits with Secure Media Solutions," describes these applications in more detail.

Warehousing

Procedures similar to those described for receiving and materials handling could be applied to warehousing operations. RFID's unattended, orientation-independent reading capabilities can be highly valuable for warehouse operations. Reading zones can be created to automatically monitor certain areas of the facility, such as a shelf location, secure storage area, or container yard, and automatically record all movements. Business rules can be created to issue alerts if certain conditions are present, such as items being moved after hours, unusual transaction volume, or any movement of items with a certain dollar value. By integrating the RFID system with enterprise networks and applications, monitor and alert data can be automatically communicated to managers or security personnel, plus integrated into warehouse management system (WMS), asset management, and other software applications.

For picking operations, workers could scan shelves and bins with an RFID reader to automatically detect the storage location of the sought items. The system also can detect items that are stored in the wrong location and alert operators to the problem. Using RFID for these applications enables items to "self-report" their locations, rather than requiring human intervention to find them, thus reducing errors, saving labour, and lowering costs. Strongly expected warehouse and distribution centre benefits are a big reason leading retailers and the DoD are committing to using RFID technology and requiring their suppliers to apply tags to cases, pallets, and other logistics containers. A business case analysis by A.T. Kearney predicts warehouse labour expenses can be reduced by 7.5 percent by implementing RFID systems. Tracking inventory with RFID also will also significantly improve accuracy levels, enabling companies to reduce safety stocks and increase sales through improved product availability.

Shipping

The benefits of improved inventory accuracy translate into improved distribution operations by reducing shipping errors. RFID smart labels can provide additional safeguards to ensure shipments are complete with the correct items. Fast-reading RFID enables instant identification of the shipping container plus all of the individual items inside. For shipping, RFID readers can help packers quickly locate and aggregate all the items needed to complete an order. A reader could instantly identify all the items packaged within a case, carton, or pallet, then direct a printer to create a master bar code/RFID shipping label while simultaneously preparing and sending an EDI Advance Ship Notice (ASN). If automated readers and printer/applicators were used, no manual labour would be required to complete these activities.

Logistics

Global supply chain logistics is the fastest-growing application for RFID and may well become the largest. Most applications involve applying a smart label to the logistics container, which could be a pallet, case, carton, keg, cylinder, tote, etc., to provide shipment information or for lifetime container tracking. According to an Aberdeen Consulting report released in June 2004, 69 percent of study respondents planned to implement an RFID system to manage logistics assets within the next 24 months. The key benefit of using an RFID system is the ability to read the entire contents of mixed pallets all at once during material handling operations such as truck loading or unloading. RFID readers can identify dozens of tags simultaneously and can read through packaging. These features create interesting opportunities for unattended identification of the entire contents of pallets, transit containers, and the items inside them.

Managing pallets, totes, and other returnable transit containers with RFID represents one of the most dramatic cost-saving opportunities this technology can provide. Many returnable containers are never brought back from customer sites after shipment, forcing companies to carry excess inventory to ensure adequate supplies of shipping materials where they are needed. Almost half of the respondents to the Aberdeen study reported that logistics asset operations consume 5 percent or more of corporate revenue. Twenty-five percent of companies say they lose in excess of 10 percent of their container fleet each year. Identifying returnable containers with smart labels or fixed tags enables companies to augment their legacy bar code shipping applications by automatically recording materials shipped to customers. Companies can then find their own pallets in shipping yards or docks stacked with thousands of items belonging to dozens of companies. Higher degrees of tracking will enable organisations to lower their material costs and will provide an audit trail that can be used to bill customers if materials are not returned. The value of these applications has been proven in multiple real-world implementations.

Retail

Initial applications for RFID in the retail industry centre on improved inventory management and product availability related to warehouse and distribution centre applications like those previously described in this paper. RFID tracking is a powerful enhancement to inventory management procedures at distribution centres and the back of stores that translates to keeping more items in stock on the shelves. Improved shelf availability leads directly to improved sales—anywhere from 0.1 percent to 4percent, according to various RFID impact studies prepared for the retail industry. The dual benefit of increased revenues and decreased inventory costs are motivating retailers and consumer goods manufacturers to become leaders in RFID adoption. Retailers can reduce out-of-stocks by 0.07 percent yet still reduce overall inventories by 5 percent through improved visibility from RFID-enabled distribution systems, according to an A.T. Kearney study. Other leading consulting and research firms reflects similar figures in studies.

The RFID programs being implemented by Wal-Mart and other leading retailers require suppliers to apply RFID mostly on cases and pallets-not-individual items. These activities are a strong indication that immediate RFID value for retailers lies in distribution and warehousing applications. By facilitating improved fulfilment accuracy, cross docking, and faster, more accurate shipments, retailers can increase inventory turns, reduce unsaleables, improve stock availability, and lower warehouse labour and storage requirements.

Item level, in-store applications also are envisioned, and several high-profile trials have been conducted. Most involve tagging merchandise and tracking it either through zones and portals within the store, or through “smart shelves,” which have built-in RFID readers that can detect and report every time items are removed or returned to the shelf, which can trigger automatic replenishment and security alerts. Item level RFID also can facilitate secure self-checkout. Variations of intelligent shelf management and self-checkout have been implemented in Libraries and video rental stores.

Libraries and Video Stores

Many large libraries around the world have implemented RFID to speed material check-in, checkout, shelf inventory, and security applications. Low-cost, flexible smart labels are inserted in books and can be made invisible to patrons. Counter personnel can check dozens of books in or out in mere seconds without manually handling and orienting each item. The tags also can be used for theft detection, much like anti-shoplifting technology currently used by retailers. Librarians using portable computers with RFID readers can take inventory and find mis-filed materials simply by walking down an aisle of bookshelves. The reader can automatically detect missing materials and alert the operator.

Video stores are increasingly using RFID for similar applications. Readers are positioned at the checkout, unattended return bins, and doorways to record transactions and detect shoplifted items automatically. These library and video store operations are essentially in-store inventory management applications that can be adapted for use in many other industries.

Personal Security and Patron Management

Flexible RFID tags can be incorporated into wristbands, temporary visitor ID badges and employee identification cards and used for numerous service and security applications. RFID commonly is used on patient wristbands to provide tamper-proof, accurate identification for facility access control and security. Many Alzheimer’s disease facilities install RFID readers at all their doors to lock down and sound alarms automatically if patients try to wander through. In paediatric wards, only staff or parents may be permitted to take infants or children from a specific area or confines of a ward.

Hospitals also can use RFID to track medication dispensing, laboratory samples, and blood bags—much like bar codes are used today. RFID saves time and improves accuracy because it automatically records all item movements and does not require human intervention to scan a bar code or record data on a form. A growing number of amusement parks and recreational facilities give their guests wristbands or ID tags with RFID chips that can be used to control or limit access to certain facilities. Another application is keeping track of patrons, such as children who might become separated from their group. By presenting their ID tags at “location stations,” separated individuals can be located more easily by other group members. Hotels, restaurants, and entertainment facilities can print and encode tickets and guest identification or membership cards. The RFID card can be used for cash less payment, as a room key, and for access control to the health club and other facilities.

Cards or wristbands with embedded RFID chips also can be used for a cash less payment system by having guests prepay and loading the monetary value onto the card. Because the tag can be rewritten, guests can recharge the card or wristband after the stored value has been depleted. Personal badge and tracking systems are very widespread RFID applications to ensure employee security and safeguard corporate property. RFID transponders embedded in employee personnel ID tags provide hands-free access to secured buildings and a tamper-proof form of identification that ensures only authorised personnel are admitted. Smart labels also can also be applied to computers, furniture, files, and other objects for asset tracking
and theft deterrence.

RFID System Integration

Solutions - Systems Integration

In today's logistics operations, systems must communicate freely with multiple external applications for the purposes of sharing data, initiating actions and synchronising events. Equally important is the need to drive a range of technology - from printers and readers to real-time radio solutions, warehouse automation, vehicle tracking and remote data capture. Chess Logistics Technology has a successful 20-year track record of providing logistics solutions in all sectors including retail, FMCG, retail distribution, manufacturing and third party logistics. Newbury Data and our software partner, Chess Logistics Technology, provide a range of logistics solutions with integrated RFID, RF and Voice technology. An experienced systems integrator, we have particular expertise in interfacing our solutions with a wide range of host business systems using our powerful integration tools. We have successfully interfaced to ERP systems such as SAP, Oracle, BPCS, JBA, Baan, Movex and Navision as well as a range of in-house developed business systems.

Configurable Interface Solutions

Empirica IXact

Creating bespoke interfaces to external systems (ERP etc), is a key part of any WMS implementation, and usually involves time, cost and complexity. By using Empirica IXact, these can be drastically reduced. Instead, we provide a simple configurable solution to allow rapid interface development. Empirica IXact is an advanced module for creating common interfaces between Empirica and external systems. IXact allows inbound and outbound interfaces to be created using flexible design processes. This gives significant control of the interface process to the customer, which reduces cost and development time - leading to faster implementation.

The module will process inbound and outbound ASCII files stored locally, or transfer from and to remote machines using FTP transfer. It may be used in conjunction with other specialist software products, allowing file conversion to or from alternative protocols (TRADACOMS, EDIFACT) when transmitted or received via proprietary networks or the Internet.

Empirica IXact - Key Features

- Static data transfer
- Form-type data transfer
- Transaction type data
- Standard Added data
- Data Filtering
- Interface Timetable
- Re-send Facility
- Interface History
- Standard Interface Definitions

Data Export

- Exporting data is very flexible. A user can create data export from all logical 'export' type files in Empirica.
- Data can be exported from any field in any format, in any order separated by a choice of field delimiters, or as fixed length fields.

Data Import

- Importing data is also simple. A user can specify data in an inbound transmission and populate a specific field within Empirica files.
- As data integrity needs to be ensured within Empirica, mandatory and validated fields are automatically defined on an inbound transmission.

Wireless Communications

RF-Solutions

Empirica Task-RF

Over recent years, mobile hand-held or truck mounted RF terminals have become the accepted standard for wireless warehouse operation, and an established technology in logistics world-wide. Their use is widespread in retail, industrial, supply chain and mobile workforce applications. Working via permanent connection to radio infrastructure, the ruggedised industrial RF device has changed the meaning of warehouse efficiency by enabling real- time instruction and verification, yielding major benefits for users in accuracy and productivity.

There is a large range of advanced products on the market, and the benefit of a common standard for wireless computing, IEEE 802.11b. Empirica's Task-RF is designed to take maximum advantage of wireless computing technology, by offering a sophisticated task scheduling solution to warehouse operators. It is compatible with all manufacturers' equipment, and can operate with both spread spectrum and narrow band infrastructure.

Empirica Task-RF

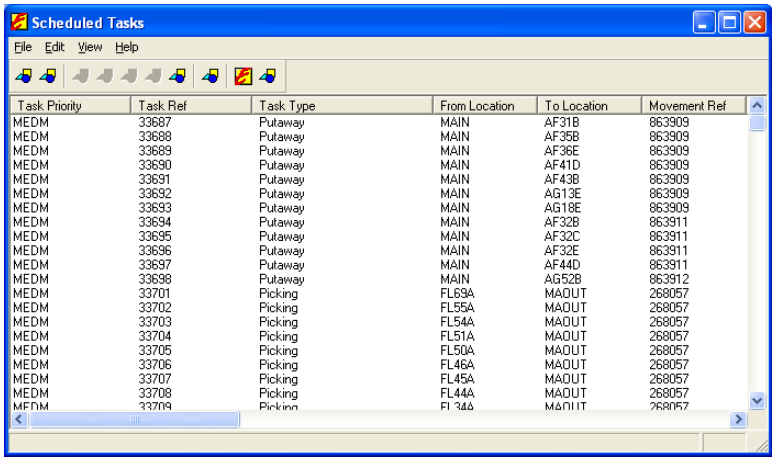
Empirica Task-RF is an intelligent task management and scheduling tool that allows you to use screen based RF data terminals and RF voice activated terminals through one common interface. Task-RF facilitates the use of the most applicable technology for each logistics task, helping to realise dramatic increases in the productivity of the workforce and accuracy of the order fulfilment process.

Used in combination with RF hand held terminals or truck mounted terminals with RFID scanners, Task-RF extends the functionality of the host application into the hands of the mobile worker with the emphasis on automated decision making through the use of user defined controlling parameters.

Some of the key features of Empirica Task-RF include:

- Tight integration with the host system is achieved using the Empirica IXact interface module
- Easy integration with RFID label printers and readers
- Intelligent task management, prioritisation and scheduling
- Task logging and status display including task problem log
- Performance monitoring
- RF user management and security
- Intuitive graphical user interface
- RF terminal set up
- Archive and restore services

Example of Task-RF Screen showing Scheduled Tasks →



Task Priority	Task Ref	Task Type	From Location	To Location	Movement Ref
MEDM	33687	Putaway	MAIN	AF31B	863909
MEDM	33688	Putaway	MAIN	AF35B	863909
MEDM	33689	Putaway	MAIN	AF36E	863909
MEDM	33690	Putaway	MAIN	AF41D	863909
MEDM	33691	Putaway	MAIN	AF43B	863909
MEDM	33692	Putaway	MAIN	AG13E	863909
MEDM	33693	Putaway	MAIN	AG18E	863909
MEDM	33694	Putaway	MAIN	AF32B	863911
MEDM	33695	Putaway	MAIN	AF32C	863911
MEDM	33696	Putaway	MAIN	AF32E	863911
MEDM	33697	Putaway	MAIN	AF44D	863911
MEDM	33698	Putaway	MAIN	AG52B	863912
MEDM	33701	Picking	FL69A	MAOUT	268057
MEDM	33702	Picking	FL55A	MAOUT	268057
MEDM	33703	Picking	FL54A	MAOUT	268057
MEDM	33704	Picking	FL51A	MAOUT	268057
MEDM	33705	Picking	FL50A	MAOUT	268057
MEDM	33706	Picking	FL46A	MAOUT	268057
MEDM	33707	Picking	FL45A	MAOUT	268057
MEDM	33708	Picking	FL44A	MAOUT	268057
MEDM	33709	Picking	FL34A	MAOUT	268057

RFID Printing

The New Printronix SmartLine Family of RFID Products and Solutions

Printronix has been a global leader in providing intelligent industrial and back-office enterprise printing solutions for 30 years. We continue this tradition in the emerging RFID (radio frequency identification) field with a full selection of SmartLine RFID product solutions, unsurpassed service and support, and educational tools that help enable your RFID applications.

SmartLine Family of RFID Smart Label Printers, Printer Applicators, and Smart Labels

A solid, reliable, smart label printer is the foundation of any RFID system. Printronix adds 30 years of know-how in providing tough industrial printers that endure the harshest environments where dust, dirt, and temperature extremes stop ordinary printers. Below you'll find a range of world-class UHF printers and solutions that provide maximum versatility and flexibility for all your RFID applications.

Benefits of Smart Labels

A convenient and economical vehicle for housing the tag, smart labels carry traditional barcodes and printed text. By combining barcode information electronic data in the same label, redundancy is provided should one aspect of the system go down, enabling product movement to continue.

- Smart labels provide unattended processing capabilities
- Smart labels can be produced easily by RFID printers for on demand applications or pre-printed and pre-coded for batch processing
- Smart labels require no line of sight placements for the reader to collect their data
- Smart labels are generally unaffected by hear, dust, humidity or other harsh environmental conditions
- Labels provide added protection to inlay for increased reliability

Certified RFID Labels

Certified Smart Labels combine the technology of thermal-transfer, pressure-sensitive labels with RFID. Printronix offers a wide range of label sizes and antenna configurations optimised for Printronix SmartLine Printers

Printronix certified smart labels combine the technology of thermal-transfer, pressure-sensitive labels with RFID. We have gone to great lengths to ensure that our smart labels—with their many different sizes and antenna configurations—provide the finest RF performance possible when used with our printers. Under software control, the printer writes data to the RFID tag, then validates that the EPC information can be read reliably. After completing this validation process, the printer prints the human-readable and bar code data. If for any reason the encoding process cannot be validated, the label is printed with an overstrike pattern to prevent it from entering your supply chain.

The following are certified Printronix RFID Smart labels compatible with our latest SmartLine products:

Class 1 Tags

- Alien ‘Squiggle’ - 4” x 2”, 4” x 4”, 4” x 6”, 4” x 8”
- Alien ‘M-tag’ - 4” x 4”, 4” x 6”, 4” x 8”
- Rafsec #313 ‘Psychedelic’ - 3” x 3”

Class 0 and 0+ Tags

- Matrics ‘Dual Dipole’ - 3” x 3”

Designed for New Emerging Standards

RFID standards are continuing to evolve. For distribution centre applications, the Ultra High Frequency (UHF) of 915 MHz is emerging as the standard frequency for reading pallets and boxes of goods as they pass into a warehouse, distribution centre, or factory floor. This frequency provides increased range and faster data transfer rates than lower frequencies. The Printronix Smart Labels support 915 MHz communications protocol and will progress to support emerging classes and frequencies.

Programming is Easy

RFID commands have been added to the Printronix PGL language, the industry standard bar coding graphics language, to provide easy transition from bar codes to Smart Labels. This allows Printronix RFID solutions to be easily integrated into your current label printing applications at a lower cost than other RFID hardware providers.

Print Quality is Important

Printronix is the only RFID printer manufacturer that includes two rolls of Printronix RFID Smart Labels and one roll of Printronix Wax Resin Blend 8500 Ribbon into your Smart Label Developer’s Kit allowing you to jump start your RFID programs. This combination of label and ribbon is designed for high print quality to meet the most demanding applications in today’s RFID environments. The Smart Label print surface employs the printing characteristics of Printronix Media 110 premium-coated paper for thermal transfer printer.

SL5000e RFID PRINTERS

Two models provide customers with a choice of encoding technologies:

- **SL5000e MP*** – provides multi-protocol capabilities to address applications that require Class 0, 0+, 1 standard
- **SL5000e C1** – provides capabilities to address applications that require an optimised Class 1 standard solution

The SL5000e MP and SL5000e C1 support the following label sizes with various antenna designs:

- **Class 1**
- Alien 'Squiggle' - 4" x 2", 4" x 4", 4" x 6", 4" x 8"
- Alien 'M-tag' - 4" x 4", 4" x 6", 4" x 8"
- Rafsec #313 'Psychedelic' - 3" x 3"

- **Class 0 and 0+****
- Matrics 'Dual Dipole' - 3" x 3"
- * Class 0 and 0+ capabilities will be available via a software upgrade, please contact Printronix or a Printronix Certified RFID Integrator for availability.
  ** SL5000e MP only

KEY PRODUCT ATTRIBUTES OF THE SL5000e

- Integrated RFID UHF encoder
- Smart Label encoding validation and overstrike capability
- PGL and ZPL™ programming languages with RFID command sets
- Unique dual-motor driven ribbon system eliminates clutch replacement and greatly reduces the risk of ribbon wrinkle for superior print quality
- Exclusive snap-in print head reduces service calls by allowing operator to easily change print heads and change from 203DPI to 300DPI printing without firmware or software changes
- Wireless/Ethernet option provides real-time data access and local printing flexibility; includes Printronix PrintNet® Enterprise, a web-enabled remote network print management system that provides instantaneous visibility to every network printer and allows users to simultaneously configure and efficiently manage an unlimited number of Printronix printers; this edition of PrintNet Enterprise also supports management of the additional RFID encoder capabilities

RFID Upgradeable Units

RFID Upgrade Kit allows a customer to upgrade their standard thermal printers to meet RFID EPC standards.

SL5000e RFID UPGRADE KITS

Choose from two different upgrade kits for RFID encoding. These upgrade kits have everything needed to upgrade a T5000e SR thermal printer to either a multi-protocol or EPC class 1 optimised SmartLine™ Printer.

SL5000e MP UPGRADE KIT – MULTI-PROTOCOL TECHNOLOGY

- UHF encoder (AWID Technology)
- Support for Class 0, 0+, 1
- RFID software program kit
- All necessary cables and connectors
- PGL RFID programming manuals
- Software migration tools for seamless encoding of smart labels

SL5000e C1 UPGRADE KIT – CLASS 1 PROTOCOL TECHNOLOGY

- UHF encoder (Alien Technology)
- Support for Class 1
- RFID software program kit
- All necessary cables and connectors
- PGL RFID programming manuals
- Software migration tools for seamless encoding of smart labels

ASSET PROTECTION

The Printronix SmartLine RFID Printers provides early adopters an RFID solution compliant to today's standards, and growth to expand to tomorrow's needs.

- **In addition, the SL5000e MP is a uniquely designed multi-protocol platform providing a foundation for protocol upgradeability and expansion through firmware updates**.

The Printronix SmartLine RFID Upgrade Kit allows companies to purchase the thermal printers they need today without worrying how they will fit into future RFID plans. This upgrade path provides asset protection on purchases made during the pilot and early adoption phase of RFID technology. The technical evaluation, pilot and adoption activities for RFID will require customers to employ a phased approach by there IT professionals. Printronix "gets it" and will provide unique programs and products to allow for a mix of thermal printer installs in the coming year.

Print And Apply

Smart label printer applicator solution that encodes, prints and applies all in one unit.

The SLPA7000^{e} is a smart label printer applicator solution that encodes prints and applies—all in one unit. It combines RFID smart label printing technology with applicator capability.

AN ENCODE, PRINT AND APPLY, RFID SMART LABEL APPLICATOR SOLUTION

The SLPA7000^{e} is a unique encode, print and apply, RFID Smart Label applicator, co-developed by Printronix and FOX IV Technologies.

Built on Printronix leading EPC RFID Smart encoding technology and combined with FOX IV's best-inclass Uniwall applicator system, the SLPA7000^{e} is the first and only all-in-one system to meet companies' RFID compliance encoding as well as in-line encode and apply production requirements.

Combining both RFID smart label printing technology with applicator capability, this RFID smart label solution delivers fast, accurate, cost-effective encoding, printing and application to users with site specific requirements.

SLPA7000^{e} SMART LABEL PRINTER APPLICATOR

SLPA7000^{e} – provides multi-protocol print, encode and apply capabilities to address applications that require Class 0, 0+, 1 standards*
The SLPA7000^{e} supports the following label sizes with various antenna designs:

- **Class 1**
- Alien 'Squiggle' - 4" x 2", 4" x 4", 4" x 6", 4" x 8"
- Alien 'M-tag' - 4" x 4", 4" x 6", 4" x 8"
- Rafsec #313 'Psychedelic' - 3" x 3"

- **Class 0 and 0+**
- Matrics 'Dual Dipole' - 3" x 3"
- * Class 0 and 0+ capabilities will be available via a software upgrade, please contact Printronix or a Printronix Certified RFID Integrator for availability.

PROFESSIONAL SERVICES

As a total RFID, print, encode, and apply solutions provider, Printronix Professional Services offers a full array of solutions that can help you reduce costs, improve operational efficiencies and reduce downtime. As a member of EPC Global, we can provide a full range of Auto-ID expertise from bar coding to RFID. Printronix Certified RFID Specialists:

- Provide Smart Label Print and Apply integration and support services
- Guide you through a rapid implementation of Smart Label Deployment
- Develop and implement a migration strategy from bar code to RFID

KEY PRODUCT ATTRIBUTES OF THE SLPA7000^{e}

- Designed for heavy industrial environments
- Easily integrates into manufacturing and distribution environments
- Performance levels ranging from 20-40 labels per minute
- Identifies and rejects "bad" or "quiet labels" – insuring 100% high-performance RFID labels
- Supports multiple label sizes for diverse product requirements
- Top and side label application orientations, as well as, roll-on/front/back
- Precise label placements within 1/16"
- Optional features for automatic label placement through XY co-ordinate adjustments
- Label roll capacity of both 8" and 12"
- Fully integrated controller board, reducing the costs and complexity found in a traditional Programmable Logic Controller (PLC)

ASSET PROTECTION

The SLPA7000^{e} is expandable and Upgradeable – providing broader long-term capabilities for your supply-chain requirements, reducing the risk of obsolescence. Supporting multiple label types increases functionality.

- **Built on the SL5000e™ MP multi-protocol platform, the SLPA7000^{e} offers a foundation for protocol upgradeability and expansion through firmware updates.**

Whether you're seeking compliance, or an in-line production based RFID solution, the SLPA7000e Applicator is the all-in-one smart label system for your supply-chain requirements.

RFID Readers

SAMSys MP9320 READER

The MP9320 UFH & MP9320 EPC long-range Readers are a breakthrough in Radio Frequency Identification (RFID) reader/interrogator design. Providing unparalleled flexibility, the MP9320 supports a variety of UHF tag protocols and provides the best defence against future obsolescence. Available in FCC and ETSI configurations, the MP9320 helps to "future-proof" your UHF hardware investment.

- **Multi-Protocol, Multi-Regional Technology**
- **Easily Supports New Tag Protocols**
- **Easy Adaptation of New Standards**

With its extended read range and high data rates, this reader is especially suited for asset management and logistics applications requiring the simultaneous reading of large numbers of tags at greater distances. With RF connections for up to four antennas, the MP9320 easily adapts to loading dock and portal installations, as well as conveyor applications, for aggregated container tracking, pallet tracking, and inventory management.

Incorporating a robust, scalable architecture, the MP9320 multi-protocol reader is Upgradeable to new, emerging protocols and standards. This release of the MP9320 supports the ISO 18000-6A and -6B protocols, EM Marin 4022, 4222 and 4223, Intermec Intellitag™, Philips UCODE EPC 1.19, EPC Class 0/0+ and Class 1. **The European version of the MP9320 also supports listen before talk functionality and sub-band operation over 865-868 MHz at power levels up to 2 watts. With SAMSys' multi-protocol, multi-regional technology, you are not limited to one tag vendor. With SAMSys, you have the Power to Choose.**

Specification

Frequency	902–928 MHz (100 KHz steps) 869.525 MHz single frequency 865-868 MHz (200 KHz steps)
RF Power	16 mW – 3W for 2.5 W ERP (4W EIRP) (FCC) 500 mW ERP (800 mW) (ETSI) 2W ERP (proposed ETSI)
Antenna	Up to four antennas
Electrical Power	15 Vdc, 3A
Power Supply	110-240 VAC Input
Communication Ports	RS-232 (EIA/TIA-232F) RS-485 (EIA/TIA-485A) 10 BaseT Ethernet 10/100 MBPS
Digital Input/Output	(4) TTL input lines (optically isolated) (4) TTL output lines (open collector, 5V, 40 mA sink)
Case Material	Aluminium
Dimensions	5 in x 7 in x 9.5 in (127 mm x 178 mm x 241 mm)
Weight	4 lbs. (1.8 kg)
Operating Temperature	-4° F to 158° F (-20° C to 70° C)
Operating Humidity	5-95% relative, non condensing
Storage Temperature	-40° F to 185° F (-40° C to 85° C)
Mounting	Horizontal or vertical orientation

Applications

- **Warehouse Logistics**
- **Item Inventory Tracking**
- **Point-of-Sale Systems**
- **Container Tracking**
- **Asset Management**
- **Pallet Tracking**
- **Parking Lot Access**
- **Baggage Handling**

Feature	Advantages	Benefits
Multi-protocol technology	➢ Easily supports new tag protocols ➢ Easy adaptation of new standards	➢ Reduces integration costs and implementation time ➢ Reduces sole-source tag protocol and hardware ➢ Protects against tag and hardware obsolescence
Multi-regional technology	➢ Supports both North American and European Union regulatory rules	➢ Single stocking item ➢ Ability to standardise on a single product offering
Multiple antenna ports	➢ Increased installation flexibility	➢ Reduces costs by supporting multiple read points and loading dock portals with a single reader
Multiple host interface options RS-232, RS-485, and 10BaseT 10/100 MBPS Ethernet	➢ Enhanced integration capability ➢ Ethernet connectivity	➢ Ability to interface a network of readers using RS-485 ➢ Reduces system installation costs ➢ Provides TCP/IP LAN connectivity for rapid integration with corporate intranets.
Scalable architecture	➢ Ability to seamlessly add components as system needs change	➢ Protects hardware investments and reduces system expansion costs
Adjustable transmit power and reader sensitivity	➢ Ability to optimise configuration for each installation	➢ Reduces false or unintended reads of tags in adjacent fields
Digital input and output lines	➢ Integrated ability to sense external triggers and control actuators	➢ Reduces system costs by eliminating the need for external hardware interfaces
Multiple tag read/write capability	➢ Full support of UHF read/write tags	➢ Reduces costs by eliminating the need for separate read and write hardware
In-circuit programmability	➢ Ability to remotely update reader software	➢ Protects hardware investments against obsolescence and reduces changeover costs when adding new tag protocols

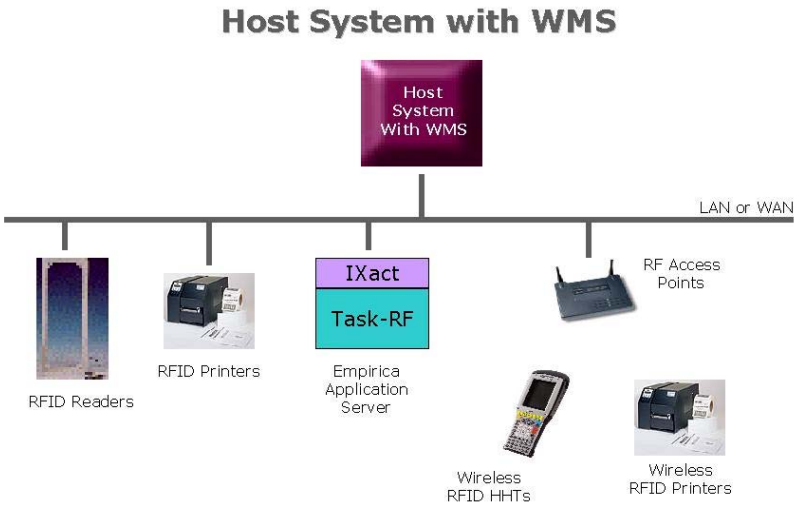
Basic Summary: Printing and Reading RFID Labels

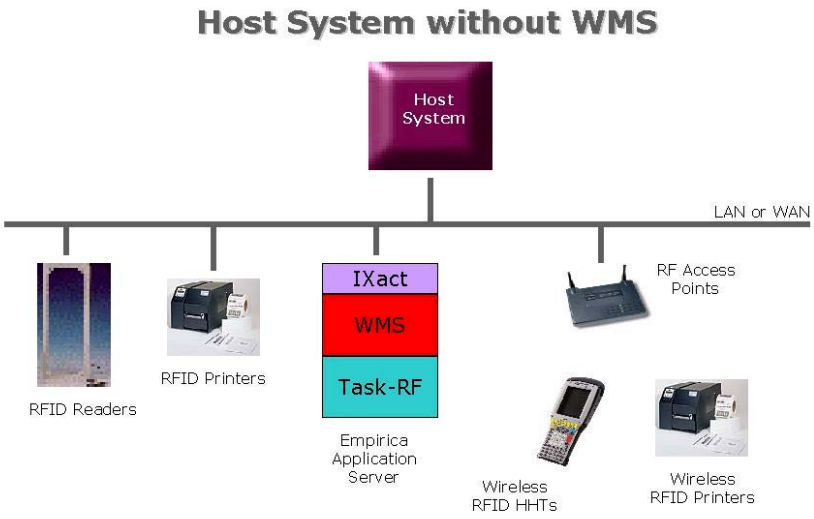
Printing RFID Labels

- RFID label print and encode data streams from the host application are sent to the RFID printer(s). The RFID printer(s) may be connected directly to the local network or may be RF enabled.
- The RFID printer encodes the smart label chip.
- The RFID printer attempts to read and validate the encoded chip.
- If the validation is successful, the printer will print the human readable and barcode data, if the chip is not validated the printer will void the chip and overstrike the label, preventing its use in the supply chain.
- A correctly validated RFID label is applied to the product or handling media (e.g parcel, case, pallet, roll cage, tote box etc …)

Reading and Writing To RFID Labels

- RFID readers connected to the network and fixed in position at a number of key locations are used to read and write data to RFID labels. In addition, wireless hand held or truck mounted terminals with RFID label-scanning capability can be used to scan RFID labels at any point where there is RF coverage.
- Every time a RFID label is read or data written to it, the host application is updated in real time. Empirica Task-RF can be used to extend the functionality of the host application into the hands of the mobile worker operating wireless RFID readers.





Frequently Asked Questions About RFID

What is RFID?

RFID stands for radio frequency identification. It is an automatic identification technology whereby digital data encoded in an RFID tag or "smart label" is captured by a reader using radio waves. Put simply, RFID is similar to bar code technology but uses radio waves to capture data from tags, rather than optically scanning the bar codes on a label. RFID does not require the tag or label to be seen to read its stored data-that's one of the key characteristics of an RFID system.

What is an RFID tag?

RFID tags consist of an integrated circuit (IC) attached to an antenna-typically a small coil of wires-plus some protective packaging (like a plastic card) as determined by the application requirements. RFID tags can come in many forms and sizes. Some can be as small as a grain of rice. Data is stored in the IC and transmitted through the antenna to a reader. RFID tags are either "passive" (no battery) or "active" (self-powered by a battery). Tags also can be read-only (stored data can be read but not changed), read/write (stored data can be altered or re-written), or a combination, in which some data is permanently stored while other memory is left accessible for later encoding and updates.

What is a "smart label"?

"Smart labels" are a particularly innovative form of RFID tag and operate in much the same way. However, a smart label consists of an adhesive label that is embedded with an ultra-thin RFID tag "inlay" (the tag IC plus printed antenna). Smart labels combine the read range and unattended processing capability of RFID with the convenience and flexibility of on-demand label printing. Smart labels also can be pre-printed and pre-coded for use. In on-demand applications, the tag inlay can be encoded with fixed or variable data and tested before the label is printed, while the label can contain all the bar codes, text, and graphics used in established applications. Smart labels are called "smart" because of the flexible capabilities provided by the silicon chip embedded in the tag inlay. A read/write smart label also can be programmed and reprogrammed in use, following initial coding during the label production process.

What is an RFID reader?

A reader is basically a radio frequency (RF) transmitter and receiver, controlled by a microprocessor or digital signal processor. The reader, using an attached antenna, captures data from tags then passes the data to a computer for processing. As with tags, readers come in a wide range of sizes and offer different features. Readers can be affixed in a stationary position (for example, beside a conveyor belt in a factory or dock doors in a warehouse), portable (integrated into a mobile computer that also might be used for scanning bar codes), or even embedded in electronic equipment such as print-on-demand label printers.

How does RFID work?

Information is sent to and read from RFID tags by a reader using radio waves. In passive systems, which are the most common, an RFID reader transmits an energy field that "wakes up" the tag and provides the power for the tag to operate. In active systems, a battery in the tag is used to boost the effective operating range of the tag and to offer additional features over passive tags, such as temperature sensing. Data collected from tags is then passed through familiar communication interfaces (cable or wireless) to host computer systems in the same manner that data scanned from bar code labels is captured and passed to computer systems for interpretation, storage, and action.

Where is RFID used?

Currently, the most common uses are found in work-in-process tracking, security and access control systems, closed-loop asset management, and car immobilises, as well as pay-at-the-pump and freeway toll passes. For example, the Ford Motor Co. uses RFID to track engine blocks through its harsh production process; Gap Inc. has used RFID to track denim jeans through its supply chain to the in-store display shelf; Exxon Mobil Corp.'s Speedpass cashless payment system uses RFID technology; and RFID tags are applied to the shoelaces of all competitors in the Boston Marathon to track them at points throughout the course and to identify them the instant they cross the finish line.

How does RFID differ from bar coding?

Conceptually, bar coding and RFID are quite similar; both are intended to provide rapid and reliable item identification and tracking capabilities. The primary difference between the two technologies is that bar coding scans a printed label with optical laser or imaging technology, while RFID scans, or interrogates, a tag using radio frequency signals. Because of the low cost of bar code labels, established standards, and global deployment, bar coding is widely accepted while, in general, RFID has been limited to niche applications. Furthermore, just as there are different bar code symbologies in use today, there are different RFID standards regarding the way data is captured from tags-the RF communications protocol.

What information is stored on a smart label or tag?

Data stored in a tag will be determined by the application of the system and appropriate standards. For example, a tag could provide identification for an item being manufactured, goods in transit, or even the short-range location and identity of a vehicle, animal, or individual. This fundamental data often is referred to as a "license plate code," similar to the information that is stored on a bar code label. When linked to a database, additional information may be accessed through the reader such as item stock number, current location, status, selling price, and batch code. Alternatively, an RFID tag may carry specific information or instructions immediately available upon reading, without the need to reference a database to determine the meaning of a code. For example, the desired colour of paint on a car that is entering the paint assembly area on the production line, or a manifest to accompany a shipment of goods.

What are some of the key attributes of RFID?

Key attributes of RFID include:

- Because tag data is transmitted and received by radio frequency, RFID does not require line-of-sight to read and write the tag data. RF signals also are capable of travelling through a wide array of non-metallic materials.
- Most RFID systems can simultaneously capture data from many tags within range of the antenna. This unique feature is known as "simultaneous identification."
- RFID tags can be read very rapidly. RFID readers are capable of capturing tag identification codes at a rate of up to 1,000 tags per second.
- RFID tags can be encased in hardened plastic coatings making them extremely durable and able to be tracked through harsh production processes. They can be read through grease, dirt, and paint.
- RFID tags can store large amounts of data. High-end RFID tags can contain up to one megabyte of memory (one million characters), although most tags only contain a small fraction of this memory, perhaps as little as 64 bits.
- Some RFID tags are able to support read/write operations, enabling real-time information updates as a tagged item moves through the supply chain.

Can RFID track me?

At the retail level, RFID is no more invasive than the bar code is today. Even though RFID uses radio frequency, the relatively short read ranges do not make it practical for use as a remote surveillance device. RFID is not-and should not be compared to-the Global Positioning System (GPS).

Will RFID replace bar codes?

No. RFID and bar coding are considered complementary data capture technologies. Even with large-scale adoption of RFID, there will be a continued need for bar coding to co-exist with RFID into the foreseeable future. The unique attributes of RFID make it an enabler of new applications, especially where the technical fit and operational benefits of the technology make it a better solution than what is in use currently.

What is EPC RFID?

The Electronic Product Code (EPC) is a new product numbering standard under development by the Uniform Code Council and EAN International that can be used to detect, track, and control a variety of items using RFID technology. The initiative started as an end-user driven research project at the Auto-ID Center of MIT. The EPC structure can distinguish unique items of the same type. For example, two DVD videos have the same standardised Universal Product Code (UPC) for the purposes of trade. Typically represented in a bar code, the UPC allows computer systems to determine the manufacturer of the DVD, the title of the film, and apply prescribed business rules to facilitate the trade or sale. EPC essentially extends the UPC code so that two DVD videos of the same title can be distinguished one from another, allowing the individual item to be uniquely identified.

Associated with EPC RFID developments are new Internet services that enable individual items to be tracked and traced globally across traditional industry boundaries. This approach to a standardised, RFID-based, Internet-connected data capture system is called the EPC Network, and is being commercialised by EAN and UCC. For more information about EPC RFID, www.uc-council.org/autoid/index.html.

Considerations when Choosing an RFID Solution

There are a number of factors that can influence decision making when determining if a radio frequency identification solution is the right solution. The following are some of the critical areas that must be examined prior to implementation of an RFID system.

1. **Consider the Audience**

   Are you dealing with a system for use entirely within the same company, or do you expect others to be able to read the information? If the latter, what type of investment would be required for those outside of the organisation, and is it reasonable to expect that compliance?

2. **Identify the Uses for RFID Technology**

   Is your environment dirty or grimy where bar code labels may not always scan properly or is it relatively dirt-free? Are you storing many similar but distinct items in one place, such as books or DVDs, where a quick scan would speed up your inventory management? Are your products expensive or subject to counterfeit? Would it be helpful if additional information about the product were accessible at different points in the supply chain or is that not a necessity at this point?

3. **Consider the Value of an RFID System**

   Bar code labels cost pennies, down to a fraction of a cent. Currently, RFID smart labels typically cost $0.50 to $1.00 (US). The return on investment (ROI) of an RFID system can be significant for certain applications, but bar coding is frequently the most efficient solution.

4. **Identify the Performance Characteristics That You Need**

   What read range and at what speed do you need to read the tags? Do you need the ability to read multiple tags at the same time? What volume of data do you want to track? Do you need to read information not in the line of sight? Is a read-only license plate good enough or do you want read/write capabilities? To what item(s) do you want to attach the smart label?

5. **Determine If You Need a Dual System**

   Printer manufacturer currently provide printers that supports 13.56MHz (HF) and are preparing UHF printers, all print human readable text, graphics, and bar codes and also encode and verify smart labels. These printers give you the ability to do either—or both—depending upon the media you use and the instructions that you give the unit.

All of these issues are important to consider when implementing an RFID system. Carefully think through the issues involved to determine the ideal solution for your needs.

A-Z Glossary

Antenna	A device for sending or receiving electromagnetic waves.
Barcode	A standard adopted to make it possible for machines to automatically identify labelled objects. The barcode was adopted because the bars were easier for machines to read than characters that humans could read. The main drawbacks of the barcode system in common use are that it can not distinguish between two items that are the same and scanners have to have line of sight to read the label.
Electronic Product Code (EPC)	A 96-bit code that identifies the manufacturer, product category and individual item. Created by the Auto ID/EPCglobal, EPC is backed by the United Code Council and EAN International, the two main bodies that oversee barcode standards.
Frequency	The number of repetitions of a complete waveform in a specific period of time. 1 KHz equals 1,000 complete waveforms in one second. 1MHz equals 1 million waveforms per second.
Inlay	The combined chip and antenna mounted on a substrate and attached to label stock to create a smart label.
Line-of-sight technology	Technology that requires an item to be “seen” to be automatically identified by a machine. Barcodes and optical character recognition are two line-of-sight technologies.
Microchip	A microelectronic semiconductor device comprising many interconnected transistors and other components. Also called a chip or an “integrated circuit”.
Radio Frequency Identification (RFID)	A method of identifying unique items using radio waves. The big advantage over barcode is lasers must see a barcode and read it. Radio waves do not require line of site and can pass through materials such as cardboard and plastic.
Radio Waves	Electromagnetic waves that fall within lower end of the electromagnetic spectrum.
Reader	Also called an interrogator. The reader communicates with the RFID tag and passes the information in digital form to a computer system.
Read Range	The distance from which a reader can communicate with a tag. Range is influenced by the power of the reader, frequency used for communication, and the design of the antenna.
Read-only Memory (ROM)	A form of storing information on a chip that cannot be overwritten. Read-only chips are less expensive that read-write chips.
Read-write	The ability to read and overwrite stored information. Chips for read-write RFID tags are more expensive that equivalent read-only chips.
Smart label	A label that contains an RFID tag. It is considered “smart” because it can store information, such as unique serial number and communicate with a reader.
Tag	The generic term for an RFID device. Tags are sometimes referred to as smart labels.
Ultra-high frequency (UHF)	The term generally given to waves on the 300 MHz to 3 GHz. UHF offers high bandwidth and good range, but UHF waves do not penetrate materials well and require more power to be transmitted over a given range than lower frequency waves.
Universal Product Code (UPC)	The barcode standard used in North America. It is administered by the Uniform Code Council

For further details please contact:

Newbury Data Recording Ltd
Premier Park
Road One
Winsford
Cheshire
CW7 3PT

Tel: +44 (0) 1606 593424
Fax: +44 (0) 1606 558383
Email: ndsales@newburydata.co.uk
Web: http://www.newburydata.co.uk