

Smart Start To RFID: Initiating A Smart Label Pilot In 4 User-Friendly Phases

A Smart Start.

Printronix has designed a smart, fast and cost-effective path to RFID. As an innovator of printing solutions for the distribution supply chain for three decades and maker of the first EPC-compatible printing solutions on the market, we have demystified RFID encoding with a complete turn-key solution and a step-by-step plan.

Already operating in the top consumer packaged goods (CPG) and retailer pilot programs, the Printronix Smart Label Developer's Kit is the easiest, most painless entry into RFID technology.

Radio frequency identification will be required of Wal-Mart and Department of Defense suppliers over the next two years. Your organization will need to investigate how to best deploy and leverage the technology. The purpose of this paper is to assist you in initiating your RFID adoption by launching a smart label pilot program using simple, carefully charted steps in four progressive phases.

DESTINATION JANUARY 2005.

Even if it weren't a requirement for doing business with Wal-Mart and DoD in 2005, RFID is poised to transform supply chain operations over the next decade. Using encoded smart labels (chip-embedded labels) allows every element along the supply chain – from the manufacturing floor, to warehouses, to store shelves – to track what the product is, when it was made, and where

it is going. The information contained in the smart label will improve efficiencies by reducing errors in receiving, keeping product in stock, decreasing misplaced inventory, theft and counterfeiting, and lowering administrative and labor costs. Ultimately, RFID can ensure products are on the shelves when customers want them, increasing revenue for manufacturers and retailers alike.

RFID IMPLEMENTATION PROCESS

1 GETTING STARTED

- Assemble your lab.
- Set up a development environment.
- Focus on technology- and solution-based companies.
- Start making smart labels.

2 TEST and VALIDATE

- Involve a knowledgeable systems integrator.
- Integrate various software applications.
- Integrate with warehouse infrastructure.
- Validate your vendor choices.
- Confirm your label solutions.
- Test read ranges, read speeds and data capture.

3 PILOT

- Develop a predictable and scalable system.
- Set up equipment in other facilities/divisions.
- Verify your ability to capture and transfer data between locations.
- Capture data by specific SKUs on a run of assorted SKUs.
- Measure results.

4 IMPLEMENTATION

- Explore opportunities for new efficiencies.
- Capture and manage data.
- Implement RFID network and device management.
- Deploy smart media management.

DON'T LET THE OBSTACLES GET IN YOUR WAY.

Along with the promise of RFID come the challenges in implementing it. Navigating your way through a complicated new system that requires its own hardware and software is a daunting mission. Combined with the complexities of evolving standards, converting today's barcodes to tomorrow's elec-

tronic product codes (EPC), and the prospect of how all of this changes the way your company functions – it is easy to understand why you might take a long look before you make the leap to RFID. But there are benefits for those who embrace the technology now, and it is possible to start smoothly and slowly, one step at a time through an achievable four-phase plan.

■ PHASE

1

GETTING STARTED

Printronix Smart Label Developer's Kit

By providing you the tools to establish a development environment, the Smart Label Developer's Kit - consisting of a UHF smart label printer/encoder, 1,000 pre-certified smart labels, and software migration tools - enables you to start printing smart labels the same day, and accelerate your pilot set-up.

With the Developer's Kit and a program launch mapped out in four simple phases, the Printronix path to RFID provides you with a Smart Start toward January 2005.

SET UP A DEVELOPMENT ENVIRONMENT.

You will want to set up a development environment for small-scale, controlled testing. As you assemble your test lab, it's valuable to make decisions with the future in mind. If you think of your integration and vendor partners as the long-term RFID team that will successfully guide you through deployment, you can plan accordingly. To help make the right choices, the following can aid you in your partner selection:

CHOOSE SMART PARTNERS.

In this early adopter, emerging technology phase of RFID, there are many vendors jumping into the marketplace with promises of expertise to help with your RFID deployment. Therefore, it's more important than ever to focus on technology-based and solutions-based companies that can help you migrate and upgrade in a timely way through each level in your implementation process. It's essential that external partners on your pilot team are leaders in the field and participating members of

EPCglobal, the not-for-profit standards organization leading the adoption and implementation of the EPC network. EPCglobal members work hand-in-hand with the leading retailers, suppliers and DoD. As a participant in EPCglobal, your RFID partner can better understand your business requirements for effective implementation, can influence developments and progress by integrating technical, cost and performance needs into standards, and will keep your organization's program up-to-date.

Look for vendors who can provide a fully integrated, cost-effective development environment along with:

Experience and core competencies

Your software and hardware partners should be technology-driven and market-driven companies, as opposed to product-driven, with a successful track record of offering auto-ID solutions specifically designed for the supply chain, such as compliance. Your ideal partner will have in-depth experience that goes beyond simply a product offering and beyond RFID. Also note if

Certified labels

Look for a vendor who will certify smart labels and will offer capacity to co-develop labels to your specific needs.

The process of making tags and antennas and embedding them into label media is advancing, though not widely mastered. Smart labels need to be matched closely to the encoding process you're using, and your experience can vary dramatically with different forms, conversion processes, inlays, and the ability to detect good labels and sort out the bad ones during the encoding process. Beware of vendors who have entered the market by converting labels or approximating a certified smart label.

In the long run, using certified labels will save you significant time and money, as well as spare the consequences (fines, downtime, returned shipments, lost opportunity) of nonconforming labels.

they are early adopters of the RFID technology, have experience specifically related to the Wal-Mart and DoD mandate, and are directly involved in numerous pilot programs.

Solution builder commitment

Success starts at the top. As you analyze RFID partners, ask what their management's vision is of RFID solutions. Is RFID a company priority, supported by the entire management team and funded for development? Do they provide an end-to-end solution? Does their organization have a professional services group that can help with the seamless integration into your enterprise network without business interruption?

After sales support

Support and maintenance issues continue long after the initial installation. Your partners' product and application engineers should engage in an ongoing dialogue, answering your questions, assisting you with ways to accomplish your RFID objectives, and listening to your feedback. They should continue to provide technical support throughout your program, helping with the full range of technical concerns, from integration, to spare parts, to trouble-shooting the entire system.

START MAKING SMART LABELS.

Since labels carry the passwords that get your carton into the warehouse, they are the logical starting point for your pilot program. With the Printronix Smart Label Developer's Kit, you can produce smart labels right out of the box. Its software migration tools provide a seamless transition to encoding and printing smart labels without high reprogramming costs, official EPC numbers,

or changing anything within your front end or back end applications. These tools include a suite of applications that convert standard UPC and Global Trade Item Number data from barcode print data and allow you to simultaneously print and encode them into the RFID tag. The applications' flexibility allows you to select from many common shipping label templates such as ITF-14 and UCC/EAN-128. And while the codes printed on the labels won't be the final EPC (as standards are still being developed), they can be written, printed and verified for this initial testing phase.

LABEL TESTING.

Now that you can encode smart labels without having to wait for EPC numbers, you have the means to test read ranges, read speeds and data capture. You can determine the distance from which the labels can be read, whether RF signals are affected by the products themselves, where you should locate the label on the carton, and variations to read angle and distance. As you become familiar with optimum read speeds and work out the intricacies of capturing and reading data, you will, most importantly, arrive at solutions to improving and maximizing system accuracy and efficiency.

THE SCIENCE OF LABEL PLACEMENT.

Package contents and label configuration, design, space and angle all can make a difference between a 100% read rate and a 0% read rate. You will need to keep these factors in mind as you determine the placement of your smart label on the case or pallet.

Package design – Adding a smart label to cartons and packages that were designed by marketing to achieve brand objectives may limit available physical label space. Determining

placement is an exercise in problem solving and trial and error as you contend with existing package and label sizes and graphics.

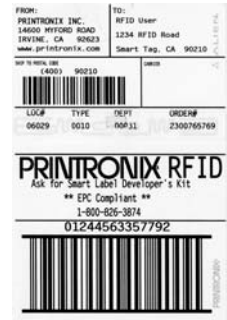
Label requirements – In large products such as a television or printer, the carton it comes in will be tagged. The smart label will identify the individual item, advancing the identification to item level marking.

Package contents – Liquids and metals absorb or reflect radio waves. Careful application of smart labels is required for items such as foil-bagged chips, liquid detergent, and canned goods. Often the effective area is extremely limited and it will take extensive experimentation.

LABELS: THE GOOD, THE BAD, AND THE QUIET.

A label is considered good when the RFID data is written to the tag correctly,

the correct image is printed, and content data is verified against the source. If the printed and encoded data can't be verified against the source, the label is considered defective and voided from the system. To ensure that no EPC numbers are lost, the printer should be programmed to clearly overstrike and void the defective label and print another label using the same EPC data. When a verified tag can't be read from a normal distance, it's called a quiet label. In some cases a quiet label may be the result of a defect in a specific label within a roll of good labels. Your print/encoding system should be designed to distinguish between quiet and non-quiet labels, removing yet another source of error. A quiet label needs to be eliminated from use if you want to achieve 100% read rates.



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PHASE 2 TEST and VALIDATION

INVOLVE A KNOWLEDGEABLE SYSTEMS INTEGRATOR.

RFID is uncharted territory, and it's a long journey to deployment. You will need an experienced guide who understands your existing operations, processes and systems. Your integration partner should not only have RFID expertise, but should also have the industry knowledge to help you develop an implementation plan that defines all workflow tasks, responsibilities, milestones and related costs, and assist in establishing realistic performance targets. The integrator is your co-pilot, so test their background in supply chain

solutions, look at their credentials in technology, and ask about their work relating to the Wal-Mart and DoD mandate.

INTEGRATE VARIOUS SOFTWARE APPLICATIONS.

In this phase of test and validation, integrating RFID technology into your ERP (Enterprise Resource Planning) and WMS (Warehouse Management Systems) throughout your operations allows you to preview the extent of capabilities RFID brings to your enterprise and the supply chain. Because RFID supports such areas of your business as resource



planning, parts purchasing, order tracking, customer service, inventory management, transportation management and accounting – by providing extensive, real-time, accurate information – it's predicted that you will realize significant gains in efficiency. Early in your vendor partner selection, note that for smooth sailing in this phase, select equipment that fully integrates with leading WMS and ERP suppliers. For software, look for complete turn-key solutions such as Manhattan Associates' RFID-in-a-Box.

INTEGRATE WITH WAREHOUSE INFRASTRUCTURE.

Simulate a dock door and a conveyor using fixed-mount readers as the Smart Label Developer's Kit creates a sampling of labels for typical cartons and pallets. (You might also choose to begin your testing in the established lab of an integrator partner for this initial phase.) Products such as Alien Technology's RFID Development Kit with reader, antenna and development system software will accelerate your progress through this phase.

VALIDATE YOUR VENDOR CHOICES.

As you approach your pilot program implementation, evaluate how your equipment is working for you. No matter what manufacturer you team with, there are expectations you should maintain for RFID. For example:

- Make sure your printer partner offers:
 - complete encoding solutions
 - RFID extensions and drivers
 - ability to extend your development environment to more than one printer to support pilot runs of 10,000 to 50,000 smart labels.
 - certified smart labels in unlimited quantities

- rapid development capability for your unique label design
- Printers and labels need to work together with the RFID equipment, communicating information back into the ERP or WMS system.
- Reader partners should be able to provide RFID solutions for various global frequency requirements as they evolve. During the implementation phase, readers can be positioned depending on your needs at various locations such as shipping and receiving dock doors, product routing conveyors, picking and sorting configurations, and forklifts. Handheld readers facilitate inventory counting, locating and reconciliation, and should have the ability to capture both barcode and RFID.
- For your reader partner, look for vendors who can offer solutions to your various geographical and form factor requirements.
- Support services are always available to assist with product documentation and integration updates, repairs, spare parts and technical support requirements.

For all vendors, make it a point to find out their support strategy, and ask if they have established alliances with market-leading partners in RFID project planning and deployment strategies.

CONFIRM YOUR LABEL SOLUTIONS.

During test and validation, solve where to position labels on different product types and how to apply as volume increases. As an example, in the case of one particular bottled drink, we found that tag placement for 100% read rate was critical to within 1/4".

■ PHASE **3** PILOT IMPLEMENTATION



FEARLESS PILOTING.

The objective of the pilot program is to develop a predictable and scalable system. This requires you to achieve precision in placement, output and performance. Careful measurement and documentation throughout this phase will facilitate problem solving with your partners and selected customers, to ultimately eliminate errors and establish processes. You will want to mark critical milestones to chart the development of your system. Along the way, stop and assess your solutions – is smart label placement formulated and confirmed for different products? Should you run parallel pilots for different divisions of your business because of significant differences in processes? Is it time to incorporate additional smart label printers to your system?

The pilot phase is the time to tool up for handling greater volumes with real-life criteria in actual working environments. You will build knowledge and confidence in the system as you work out the everyday demands faced by your business, even though you are applying the tests only to a limited volume.

In order to achieve the pilot objectives, you will want to:

- Set up equipment in other facilities/divisions to discover and solve any anomalies within each facility.
- Verify your ability to capture and transfer data and send it between locations.
- Capture data on one specific product out of a test run of assorted SKUs.
- Educate employees on the importance of the RFID system and how it will

affect the way they work. If tags are being applied manually, this is a critical part of the learning curve.

- Partner with a retailer to send test shipments to verify system compatibility.
- Subject the system to the rigors of a typical production or shipping facility.
- Handle higher volumes (50,000 or more).
- Measure results to test the viability of larger scale.
- Work with your partner team to eliminate errors.
- Consider expanding your pilots to additional products or geographies after successful completion of your first. You may find that different divisions or product lines require different pilots.

You will have successfully accomplished your pilot implementation if you have:

- Measurement of results, including establishment of performance metrics.
- Integration of ERP/WMS to extract the data out of the label and pass the information back to the system for operations management.
- Defined different label and antenna requirements for different SKUs.
- Programmed your system to detect human errors in tasks such as label selection and placement as your equipment checks the data and media and alerts you to problems. Your systems and processes will become systems and processes error-proof.
- Decided: manual or automated application of smart labels, in-process or post-process? On January 1, 2005, only those products shipping to three Wal-Mart distribution centers in Texas

are required to have full RFID compliance. It may be more cost effective for the year 2005 to limit your RFID compliance to only those products shipping to those specific warehouses. If you are running out of time, consider the feasibility of making the application of smart labels a post-production step rather than an integral part of the manufacturing process. Depalletizing cases, adding smart labels and repalletizing might be a viable short-term solution. The safest and best way to help you make this decision is to consider three factors: 1) volume, 2) number and percentage SKUs you need RFID on, and 3) how extensive your current automated process is.

EXPECT SOLUTIONS.

Solving RFID implementation issues, even if the requirement is for a small percentage of your shipments the first year, will provide a strong foundation for the following year when 100% of Wal-Mart shipments require smart labels, and DoD requirements become effective. By the end of Phase 3, you will have locked down your business processes and procedures, tested software and hardware, and verified your system accuracy at higher volumes and speeds. For scheduling purposes, Phase 3 should be completed by the end of Q3, 2004.

■ PHASE **4** IMPLEMENTATION

THE FUN BEGINS.

Though full RFID deployment is still ahead of us, hundreds of companies are on their way. Whether you are just starting or already piloting, several issues considered in your early decision-making will facilitate a more efficient, successful implementation.

SELECT VENDORS WITH AN UPGRADE PATH AND THE RIGHT EXPERIENCE.

Technology is evolving, standards are not resolved, and protocols will change. Smart labels will migrate to Class I, Gen 2. These changes in the industry will mean changes in your equipment. So choose a vendor offering asset protection to protect your investment, with upgradeable firmware (for example, to the proposed 96-bit standard) and scalable

solutions so you won't have to start over.

We suggest that you ask a set of pertinent questions to help you make informed decisions about product and vendor selection:

- How many pilots are they working on?
- Can they articulate examples and case histories from their experiences related to the Wal-Mart requirement?
- Do they have a strong list of RFID partners?
- Are they a global company to manage your international locations?
- Do they offer formally organized professional services such as label design and verification, on-site assessments, training, and integration and migration consulting?



THE PATH TO ROI LIES BEYOND MERE COMPLIANCE.

During the implementation phase, you will explore opportunities for new efficiencies and build metrics into your processes to quantify improvements, forming a foundation for ROI. This reinforces that the solutions you pick for pilot runs need to be scalable, robust and industrial strength for cost-effective deployment. And even if your processes include manual application of labels for shipping (slap and ship) at this point, it's important to keep your future automation capabilities in mind as your system expands. This is a critical factor when choosing your printing solution.

Deploying smart printers will provide building blocks to ROI:

- **Total quality control: validation and verification** – With validation built into printing equipment, you can correlate 100% barcode reads back to 100% RFID reads and be able to cross reference. Without manual intervention, your system will be able to check every label against your database to verify that what you read on the label is actually what it should read. If there is a discrepancy, it will immediately back up, cancel and overstrike the label, and print a correct replacement. Read-after-print quality control is designed to eliminate defective labels from entering the supply chain. It will also prevent print production slow-down, minimize the cost of labor, and avert product returns and fines for non-scannable labels.
- **Data capture** – The ability to archive information for enterprise management brings the highest level of visibility to your operations. Through

data capture, nearly instantaneous visibility of supply chain activity allows you to make more accurate sales projections and purchasing decisions. EPC data, once integrated into your database, can provide time, location, and batch information that when passed back into the system, can identify and locate specific products at any point in the supply chain.

- **Network and device management** – Access to real-time information and control of your devices improve efficiency and productivity and help you make informed decisions in managing them. Network print management systems will provide instantaneous visibility to every discovered device and allow users to simultaneously configure an unlimited number of printers. These print management solutions will also support management of the additional RFID encoder capabilities. Providing instant visibility (enterprise view), instant notification through e-mail alerts and pages, and remote diagnosis, these tools will enable you to send test results over the printer network for viewing and storing in an XML file (or other formats) for later comparison with the data stream sent to the printer.
- **Smart media management** – Your application will police itself and alert you if something is wrong. If the EPC doesn't correlate product to label, you will be notified immediately. Proactive detection will ensure the label placement is right, the class of label is right, and the antenna design is right for the label.
- **Industrial design** – Your equipment is an investment in the future. To support you from test to pilot to deployment, your printer will need to be rugged and

dependable, able to handle growing volume. Remember that the cost of a printer itself in the overall scheme of things is insignificant relative to the investment in infrastructure, tags and costs of non-conformance and non-compliance as you consider the downtime, lost productivity, fines and product returns.

SMART LABELS WILL GET SMARTER.

Developments in RFID technology will continue to yield larger memory capacities, wider reading ranges, and faster processing. Though the cost of RF chips prevent RFID from replacing barcodes any time soon, the technology will continue to flourish because of its interactive capabilities. And like memory for PCs, we can't predict what the cost will be for chips in the near or distant

future. But we do know that their growth and speed will increase exponentially, creating capabilities that will have a major impact on supply chain operations over the next few years.

We urge you not to let the uncertainties or the cost of tags keep you from learning about RFID and its benefits to your business. We are in the early adoption phase today, and the uncertainties will be solved in time. Adopting RFID today affords you the opportunity to grow with the technology, to define and refine your system and realize the benefits sooner. You don't have to worry about how to get started – you aren't alone, and there are easy-to-follow solutions. With integration and vendor partners you can trust, your route to RFID is a well-marked one.

PRINTRONIX YOUR SMART LABEL PARTNER

Recognized worldwide as the leader in industrial printing technologies and integrated enterprise printing solutions for the distribution supply chain, Printronix is committed to supporting consumer packaged goods companies in the development and deployment of RFID solutions. Partnering with other EPCglobal members in the Printronix RFID Partner Program, our goal is to offer ease and dependability, unmatched project support, product fulfillment and access to RFID experts and top-tier integrators who can guide you through the process and ensure that your RFID solutions align with your enterprise applications.

Printronix's integrated network programs, such as Online Data Validation (ODV™) and PrintNet® Enterprise, improve the printing of bar codes, labels and forms while verifying accuracy and offering flawless diagnostic technology. Based in Irvine, Calif., Printronix has operations worldwide. For more information about Printronix or to see how you can Smart Start your RFID program, please call 800-826-3874 or visit us at www.primtronix.com.



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RFID Partner Checklist

As you launch your RFID pilot program, choose smart partners. Consider the following requirements for your integration and vendor partners:

- Participating member of EPCglobal
- Partnered with other experienced RFID partners
- Can provide upgrade paths
- Offers asset protection program
- Upgradeable Firmware
- Scalable solutions
- Robust industrial equipment
- Experienced in RFID specifically related to the Wal-Mart mandate
- Involved in other pilots, can clearly articulate case study-type examples
- Able to validate and verify without user intervention
- Offer an enterprise network management solution
- Formal professional services organization
- Label verification testing, organize data and files for clients
- Training, integration and implementation consultants
- Global organizations to support clients' international locations and expansions
- Able to supply volume quantities when needed
- Equipment fully integrates with major supply chain software and other enterprise programs