

RFID LineMaster Application Note in Automated Labeling



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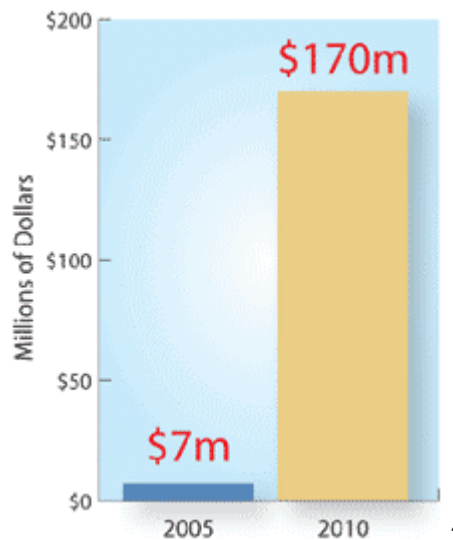
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RFID labeling mandate is on. Are you ready?

Manufacturers of RFID enabled printers were the front running suppliers who sold into the RFID labeling solution's market. Typical slap and ship solution enables a customer to print bar codes on RFID labels, encode the RFID tags inside the labels and then verify that the tags' encoded data can be read. Because of the low volume of tagging requirement, RFID enabled printers got attention as they could be used to quickly create a total slap and ship solution.

Companies such as Intelletto Technologies Inc have also offered slap and ship RFID compliance labeling solutions. These solutions do not require the customer to have an RFID enabled barcode printer. Instead the customer will make use of their existing barcode label printer. Using label printing software, they print serialized barcode and then encode and verify their RFID tags from the barcode without the need of a host computer.^{1 2}

As the need to attach RFID tags on the item and box level arises – Wal-Mart, DOD Pharmaceuticals, etc – , it is becoming evident that use of label applicators in order to perform automated encode, apply and reject will slowly but surely substitute the conventional slap and ship methods.³ Automated RFID tagging requires related industries to adjust and integrate means to read, verify and program RFID tags in a way that meets the speed requirement during label conversion, label application and material handling.



In 2005, UHF-based printer-applicator-encoders were a \$7 million market, but that will grow to \$170 million by 2010, according to Venture Development Corp., the Natick, MA-based research and consulting firm.⁵

¹ UHF Multiport Companion applications, http://www.intelletto.com/uhf_multiport_application.htm

² UHF Line Master H05 applications, http://www.intelletto.com/uhf_linemaster_application.htm#TagProgrammer

³ Tery Lisa, "Spotlight on Printer Applicators", Supply Chain Manufacturing and Logistics, June 20, 2006, http://www.scs-mag.com/index.php?option=com_content&task=view&id=1576&Itemid=87

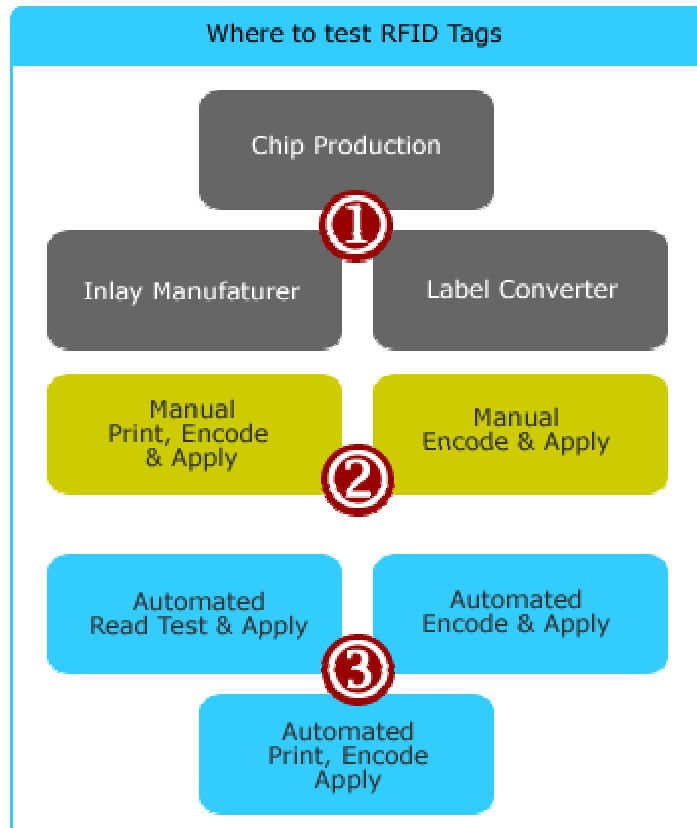
⁴ ibid

⁵ ibid

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Where to test RFID tags?

Because RFID tags consist of Antenna and a chip, to make sure that RFID tag is working you have to check the tag in various stages before and during the attachment of RFID tags to the goods.



In coming years as demand for automated application of RFID tags increase, the sales of RFID Compliance labeling solutions will increase for level 3 and most likely decrease for level 2.

Chip Manufacturers perform tight quality assurance procedures to make sure that chip has been manufactured according to the specification. But the chip without antenna is of no use to anyone.

Inlay manufacture will have to make sure that the inlay is functional after attaching/printing the antenna. Due to the higher speed of manufacturing inlays, testing them does not include writing and not even reading the whole memory. The procedure is reduced to identifying quiet tags. Inlay manufacturer usually marks the damaged inlay but the defective tag remains in tag bundle.

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High speed label conversion processes pride themselves in their ability to remove defective tags from rolls during the conversion process. ⁶ This QA process is performed in Stage 1 of the above diagram.

According to RFID Switchboard's BUYERS' GUIDE to Passive Labels (Smart-Labels), *QA is probably the most important step, even though it is the least understood.* ⁷

It is during the QA process that the defective labels and inlays are identified either by being marked or IC punched out or tag is removed leaving an empty space, or the tag is replaced with a good tag. ⁸

In a typical high speed RFID encode, print and apply process, the following questions are quite important and would be very much affected by the QA process the label converter uses in Stage 1 QA:

- What is the typical speed of your label application line without RFID?
- Do you apply converted RFID inlays that are already encoded, which means that you will only have to verify and apply?
- Do you have to encode during the label application process and then verify?
- What loss of speed can you afford in order to encode and verify RFID labels?

Moving towards automated solution

With expected move towards automated RFID application, there are number of manufacturers who will notice their sales increase for RFID enabled equipments.

- 1- Automated Check-Divert solution providers
- 2- Check-Apply solution providers
- 3- Encode-Apply solution providers
- 4- Print-Apply-Check solution providers
- 5- Print-Apply-Encode solution providers

"There is a more complex interface to the applicator"

Matt Ream

For RFID functions, adds Matt Ream, senior manager of RFID systems at Zebra Technologies.

For example, Zebra provides an applicator interface port to allow the application to interface to the user's proprietary port or PLC to monitor and act appropriately.

Which one is the best

Not every one needs to have the RFID tags printed in combination with barcodes. For those who will choose to have the RFID as a separate entity on their packaging the best solution to make sure that tag is alive and/or encoded properly is to have a check/encode applicator solution.

⁶ Claire Swedberg, "Label Printer Promises Fail-safe Tags", RFID Journal, Jan. 18, 2005, <http://www.rfidjournal.com/article/articleview/1345/-/1/1/>

⁷ BUYERS' GUIDE to Passive Labels (Smart-Labels), RFID Switchboard, <http://www.rfidsb.com/modules/edito/content.php?id=40>

⁸ ibid,

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As the applications of RFID in packaging industries advance, we expect to see more attention toward separation of encoding, checking, printing and packaging for RFID tags in different stages of production and packaging process. An example of this separation is where you have a package with RFID embedded in the corrugated. Obviously there would be no chance to use an RFID printer/encoder to verify and encode embedded the RFID tag thus solution like automated check/encode and divert will be the best choice.

Print/encode or print/encode and apply solutions also are here to stay. For those who are inclined to do combination barcode/RFID labels for the product tagging needs. However we expect such applications to be restricted for Pallet level and perhaps box level tagging. As we move more towards item level tagging, RFID tags will be embedded in preprinted product labels and high speed check/encode/apply solutions will be needed.

Therefore labeling solution providers will bear the pressure of coming up with more innovative ways of doing RFID Check/Encode/Apply faster and more error free within the framework of electro mechanical limitations of their existing solutions. All these solution providers have very similar challenges in implementing RFID into their solutions. The most important question for each of them is if they need RFID expert in house or they can rely on RFID equipment manufacturers to address their needs. There are many factors to be considered to successfully move to RFID for these providers such as:

1. User interface
2. Different tag sizes and protocols
3. Different frequencies
4. Antenna design
5. Elimination of electrostatic charge on rollers
6. Interface to PLC and controller of applicators

“the question becomes scalability”

VDC's Liard

To date, middleware—largely used on desktop RFID bar code label printers to generate RFID labels in concert with bar code data—has done a good job in managing the communication of RFID data between hosts and printers.

As applications move from desktop printers to printer-applicators, “the question becomes scalability,” says VDC's Liard: can these solutions cope as data volume increases?

Software enhancement will be an area of focus moving forward, he says.

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Why Intelletto Technologies?

Intelletto was founded in 2003 by a team of software and hardware professionals with extensive experience in wireless technologies, logistics, and business consulting.

Our product strategy is based on recognizing the challenges of RFID implementation and minimizing them by developing RFID technology that is flexible because of its onboard intelligence. This built-in intelligence provides operating instructions and processing power to our RFID devices without the need for supporting computers or middleware. These abilities give the user maximum flexibility at minimum cost. Our product lines allow companies to proceed with their RFID implementation plans without worrying about hype and many avoidable implementation expenses, thereby increasing their productivity and return on investment.

Seamless integration of different frequency standards with unified interface saves a lot of research and development money at your side. Intelletto constantly updates and integrates both UHF and HF product lines as more protocols become available.

Our development kit contains every piece that you might need to quickly integrate RFID into your machinery. Your automation specialists will be easily able to integrating our products into your machinery very much like familiar PLC integration.

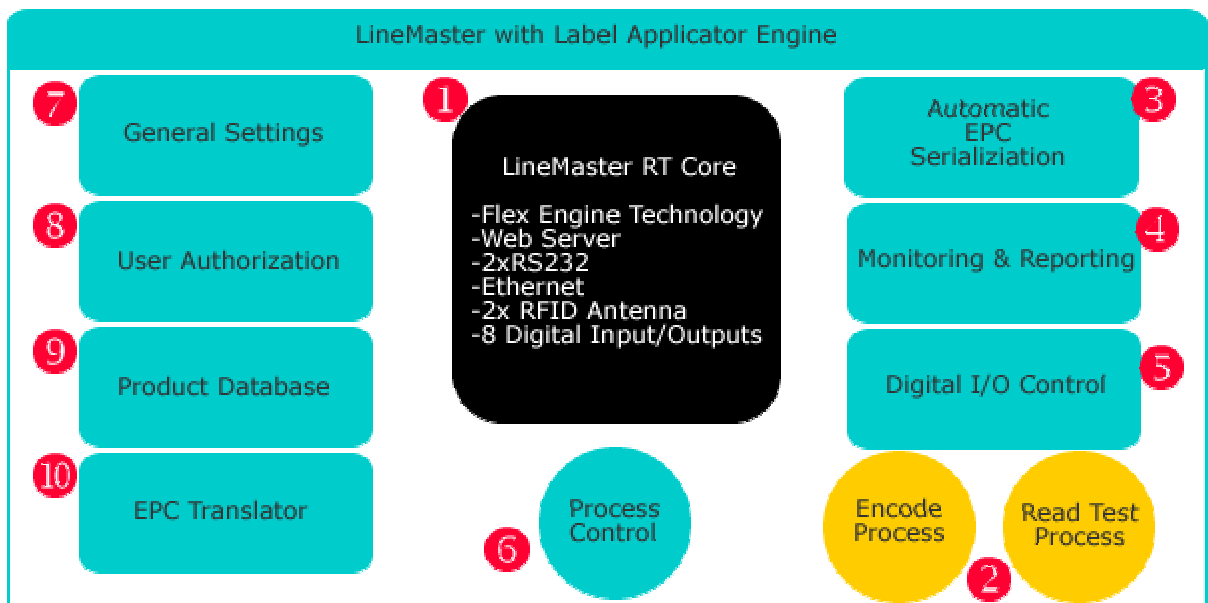
We have eliminated the need for computer to control data flow and EPC formatting but have not compromised anything in speed and reliability for reading and encoding RFID tags. Your end users will appreciate that they can access and change settings for your machinery from any where on their network or even use PDAs.

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A Glimpse of LineMater Label Applicator Engine



LineMaster designed based upon FlexEngine technology which affords full programmability. Users have the option of choosing the setup (Engine) that is best suited to their needs. LineMaster comes in an industrial standard din-rail mount package which makes it easy to install within the current infrastructure at machinery and conveyor belts. Below is a schematic diagram for RFID LineMaster with Label Applicator engine.



- 1- LineMaster real time core with FlexEngine technology. Programmable through browser,
- 2- Two concurrent processes: Encode tag and/or read the tag and issue success/failure result,
- 3- Automatically issues the serial number required in EPC standard,
- 4- Keeps track of good bad result for both processes and provides user reports,
- 5- 4 digital inputs and 4 digital outputs pulled up to VCC,
- 6- Real time control of processes,
- 7- Settings for all inputs and outputs, tags and IP address and etc,
- 8- Two level user authentication (administrators and operators),
- 9- Stores product information in flash memory,
- 10- Translates all known barcode standards to corresponding EPC,

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How fast you can do it

To calculate read and test or encode time use the chart below and add the overhead of you mechanism to properly adjust the tag in front of antenna. This calculation is for all tag to be healthy and gives you the maximum speed for both reading and encoding.

LineMaster			
Tag Type	Gen2	Class 1	Class0/Class0+
Read Per Minute	2000	2000	2000
Encode Per Minute	500	120	120

Good tag dispense using LineMaster			
Example Applicator (150 Millisecond overhead)			
Tag Type	Gen2	Class 1	Class0/Class0+
Read Per Minute	333	333	333
Encode Per Minute	222	92	92

Bad tag reject good tag dispense using LineMaster			
Example Applicator (300 Millisecond overhead)			
Tag Type	Gen2	Class 1	Class0/Class0+
Read Per Minute	180	180	180
Encode Per Minute	140	75	75

Other factors may reduce the speed of your mechanism. The way that you dispose of the bad tags will affect the overall speed. The most common ways to get rid of bad tags are as follows:

1. Use a diverter bar to push the bad tag off onto a collection area.
2. Leave the bad tag label on the liner.
3. Apply the bad tag and divert the carton farther down the conveyor.

In the first two approaches, you will get a chance to encode or test another tag and apply. The more you try the slower overall process you will get. Bad tag management is something that you need to think about and advise your customer based on their needs. For full automated high speed lines probably the best methods are the first two but for a slow line with enough personnel the third option will reduce the cost of equipment.

Another point that determines your limits is whether you are using pneumatic or electric diverting mechanism. Usually electric mechanisms are faster.

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Benchmark

Let's look at the specification for some of the leading manufacturers of printer, applicator equipments. You can calculate your speed using the chart above and compare your speed with others:

Model/ Manufactures	Print	Print Encode	Print Encode Apply
Zebra industrial printer R110XI:	203 dpi:10" (254mm)/sec 300 dpi: 8" (203mm)/sec		
Printronix SLPA7000R		Up to 60 label/minute	
Diagraph PA/5000LT			80 PPM 4" long label 65 PPM 6" long label