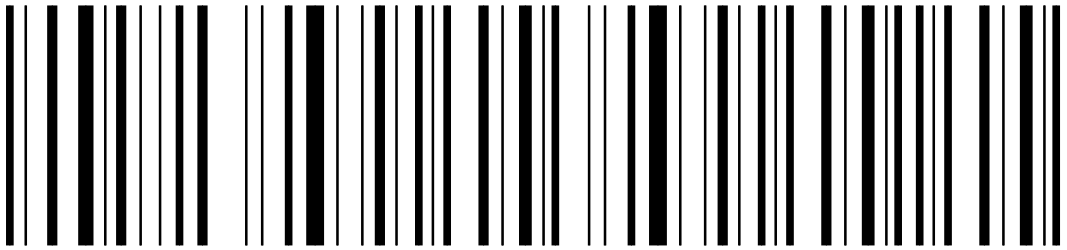
Brand Protection in the Supply Chain:

Protecting Products and Profits with Secure Media Solutions



APPLICATION WHITE PAPER

Zebra Technologies

Executive Summary

Product protection is a never-ending endeavor. The threats of counterfeiting and diversion remain constant, but techniques are constantly changing. Protective measures that were once innovative and effective eventually become vulnerable, as illustrated by recent seizures of extremely high quality counterfeit holograms.

Manufacturers must use increasingly sophisticated product protection methods to preserve their brands and distribution channels. Fortunately, new resources are available. Now companies can take advantage of their existing labeling systems to further protect their products. This white paper describes new product authentication solutions from Zebra Technologies that can keep manufacturers steps ahead of purveyors of fraud. The product labeling solutions described here can be added to current operations easily and discreetly to enhance existing security measures to provide an additional layer of protection.

This white paper will:

- Introduce secure media technology options;
- Describe how secure media can be applied to products and packaging;
- Explain how secure media can be layered into other security programs and leverage existing labeling equipment;
- Illustrate the security benefits the technology can provide for production, distribution, retail, return, warranty, ticketing and other operations.

Introduction

Most manufacturers today are part of a growth industry, despite their best efforts to avoid it. Product counterfeiting and the resulting economic damages are rising sharply. Worldwide sales of counterfeit goods are expected to double from 2002 to 2003, according to research by Carratu International, which investigates intellectual property abuse. Seizures of counterfeit and pirated goods by the Bureau of Customs and Border Protection of the U.S. Department of Homeland Security bear this out, as they have more than doubled in three years (see Fig. 1 below).

Fig. 1: Dollar Value of Counterfeit/Pirate Product Seizures by the Bureau of Customs and Border Protection of the U.S. Department of Homeland Security

Year	Value of Seizures	% Change
2000	$45 million	—
2001	$57 million	+ 27%
2002	$98 million	+ 72%

Sources: Bureau of Customs and Border Protection of the U.S. Department of Homeland Security data, International AntiCounterfeiting Coalition.

The average Fortune 500 company spends between $2 million and $4 million annually on product protection security, but fake goods continue to flood the market. Counterfeit trademarked goods account for eight percent of all world trade according to the International Chamber of Commerce.

The damage from counterfeiting would be even greater if not for the many security measures that manufacturers undertake. The leading defense against counterfeiting is product authentication. Manufacturers place special marking on products or packaging that distributors, retailers and consumers view to verify authenticity. Secure media for on-demand printing is a powerful complement to authentication programs that is simple to enact but can raise protection significantly.

Products are traditionally authenticated by using a reader to detect the presence of the authentic material on the item. Emerging "intelligent authentication" solutions go beyond detection to provide identification of the specific item, at the serial number or production batch level. Identification and detection are important concepts to understand and consider when planning product authentication strategies. Intelligent technologies offer new protections against warranty and return fraud, and enable new inventory control and life cycle management applications throughout the supply chain.

Integrating Protection with Existing Operations

Now there is a line of secure authenticable media that has been specifically created for use with existing on-demand, variable-information label printing systems. Zebra's secure media enables users to easily add new layers of protection to their security programs without changing business processes or investing in new equipment. Authentication technology is available for the wide range of media that Zebra label printers already support, including many paper, tag and synthetic label materials, so users have great flexibility to create secure product labels, nameplates and many types of packaging. Authentication features are built in to the blank label stock, which is loaded into the printer and used as usual. No operator knowledge of the secure media is required, and no changes are required to existing production processes.

Secure media for on-demand printing is a practical and very cost-effective tool to protect goods in every corner of the manufacturer's facility and throughout the supply chain, including returns and reverse logistics operations. Zebra's secure media line can be used with printers used to create labels for pallets, cartons and other packaging, individual items, components and any part or packaging that receives a label. Secure media is so cost-effective and easy to use it can be applied at any point in the distribution process by wholesalers, transportation providers or distributors with their own security and traceability needs.

The ideal authentication solution is extremely difficult for counterfeiters to copy, is cost-effective to include on all products, deters fraud as well as detecting it, and is convenient enough to be checked at all levels of the supply chain. This ideal may be reached by combining, or "layering," several types of protection that offer different levels of security and convenience. To determine the best authentication technology or combination for your products and operations, you must first understand the available authentication technologies, their capabilities and limitations.

Traditional authentication solutions, and intelligent media capable of securely encoding variable data, are available to address needs ranging from simple authentication to advanced security, tracking and inventory control. Secure media is ideal for adding a level of protection while fully leveraging investments in existing printing equipment and procedures. Secure media can significantly improve protection for just a small incremental cost.

Traditionally, verifying product authenticity required lengthy, specialized laboratory techniques. Since all products used identical safeguards, determining where the supply chain had been compromised was not possible. If authentic media were stolen it could be used to create verifiable labels or tags for use on fake products. Enforcement efforts were hampered by long response times and uncertain information.

Today however, secure media allows for end-to-end tracking through the supply chain, instant field verification, and seamless integration with product tracking systems. At the same time, these new technologies impose unprecedented layers of cost and sophistication on would-be counterfeiters.

Printers and Media

High quality bar code printers excel at printing variable information on tags and labels commonly used on products, internal components, packaging, and shipping materials. Adding serial numbers or serialized information to these forms and labels is an easy, low cost way to begin supply chain tracking that allows for identifying diverted or stolen goods, monitoring questionable distributors, or investigating warranty violations. This information can be printed as text and numbers for universal readability, or encoded in a bar code for improved accuracy and greater resistance to tampering.

The tags, labels and ribbons used in these printers provide ample opportunities for adding additional layers of product security. Tags and labels start with a paper or synthetic substrate that may have secure features built in when they are manufactured. For labels, carefully chosen adhesives can provide tamper-resistant and tamper-evident layers of security. Preprinted logos, artwork and over-varnishes can incorporate security features while also giving the media a more consumer-friendly, valuable appearance. The printer then adds variable information, either by printing directly on the media (direct thermal printing), by applying ink from a ribbon (thermal transfer printing), or by encoding a radio frequency identification (RFID) chip within the media. When a ribbon is used, images can be made more permanent and yet another opportunity for adding security features is provided.

Most currently installed Zebra printers support one or more of these new secure media so new equipment is rarely required. The media characteristics are described below and summarized in Fig. 2. Many companies can add security features to existing tags or labels without changing production processes in any way. Since no new equipment, process changes or user training are required, operators need not even be aware that secure media is being used. As a result, incorporating secure media into a security program can be accomplished very quickly with minimal investment.

Invisible Taggants

A variety of invisible taggants are available for secure media. These are engineered materials that do not exist in nature, so they can be very accurately verified. These materials have specific optical qualities that make them invisible to the naked eye, providing a covert layer of security that is difficult for counterfeiters to detect or reproduce while preserving the desirable appearance of the finished tag or label. Since the materials are invisible, they do not interfere with label readability, bar code scanning, or consumer appearance. These taggants resist heat and chemicals and can be read through topcoats and other materials applied during the label making process. Information can often be printed on top of the taggant, so no changes to label size or format are required.

Zebra offers a variety of invisible taggants with different detection and readability performance. Some taggants become visible under an inexpensive black light, allowing easy, low-cost field verification throughout the supply chain. Taggants can also be machine authenticated and thus differentiated from easily counterfeited fluorescent materials used by more sophisticated criminal organizations. For some taggants, hand-held verification devices allow authenticity to be determined, instantly and conclusively, wherever suspect goods are found. Some invisible taggants can even be detected through several layers of packaging material, so authenticity can be verified without opening the packaging.

Some invisible taggants can be manufactured directly into the paper or synthetic substrate, creating a low-cost but very difficult to counterfeit media. Taggants can also be added to a clear over-varnish applied as part of the die-cutting process. Some taggants can be incorporated into the label adhesive for more covert applications. Taggants can be added to the ink used in any logo, artwork, or patterns preprinted on the label adding additional layers of security. In some cases, taggants can also be added to the ribbons, allowing verification of variable information printed on the label as well as verification of the label itself.

Adding taggants to over-varnish, ink, or a ribbon has the added advantage that the way the taggant is applied to the media can be changed every year, every batch, or every label. This allows encoding additional information in the security process, such as place or date of manufacture, without changing field authentication procedures or equipment. Using a clear varnish, clear ink, or a clear ribbon to apply this variable information adds an additional covert layer of security.

Pattern Adhesives

Combining particularly aggressive adhesives with areas of less permanent adhesive or specially die-cut substrates allows a label to self-destruct if it is removed after application, leaving a visible mark on the object it is removed from and prohibiting the label from being reused. These overt features prevent stolen labels from being applied to unauthorized goods, and enable inventory or retail clerks to easily detect potentially diverted goods.

Structured Magnetic Threads

Magnetic thread technology uses specially-made magnetic strands that are woven into the paper substrate before it is converted into tags or labels. Because the threads are visible but woven into the paper itself, the physical appearance is extremely difficult to reproduce and a significant deterrence to counterfeiters. Threads can't be removed without destroying the paper.

Magnetic threads carry a unique identification number that can only be read with specialized equipment, has never been reproduced, and cannot be erased. The readers allow authenticity to be easily determined, instantly and conclusively, wherever suspect goods are found. The identification number may be constant or expressed incrementally for each individual tag or label. A constant ID number is ideal for basic authentication or identifying specific manufacturing locations or time periods. Incrementing numbers may be used for identifying specific products or packages, or for linking printed information to specific tags or labels.

Smart Labels

Smart labels embed a radio frequency identification (RFID) chip and antenna within the label substrate material. Data is written to and read from the chip by radio waves using non-contact RFID technology. A unique identification number is preprogrammed into the tag when it is manufactured. Additional data, such as lot code, product serial number, expiration date, or customer ID, may be encoded on the fly as the label is being printed. Like magnetic threads, both the appearance and the functionality of RFID chips and antennae are extremely difficult to counterfeit.

Because RFID is not an optical technology, tags can be read inside packaging or if the label is covered in dirt, oil or other contaminants. Read range depends on many factors, but is typically a meter or less. RFID is similar to electronic article surveillance (EAS) technology used to prevent shoplifting, the notable difference being RFID provides identification instead of just detection.

Fig. 2: Zebra Secure Media Comparison Table

	Taggants						Pattern Adhesive	Magnetic Threads	RFID Smart Labels
	in substrate	in adhesive	in varnish	in ink	in clear ribbon	in black ribbon			
Overt security	No	No	No	No	No	No	Yes	Yes	Yes
Covert security	Yes	Yes	Yes	Yes	Yes	Yes	Not usually	ID only number	Data only
Covertly identify time or location of manufacture	No	No	Yes	Yes	Yes	No	Not usually	Yes	Yes
Supports variable information	No	No	No	No	Yes	Yes	No	Not usually	Yes
Can be authenticated inside other packaging	Not usually	Not usually	Not usually	No	No	No	No	Not usually	Yes
Machine authentication available	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
Provides visible evidence of tampering	No	Not usually	Yes	Not usually	No	Yes	Yes	Yes	Yes

Applications

Businesses can position themselves to take advantage of the widest range of applications and benefits by applying secure media as early as possible in the production process. Because there are so many technology options, manufacturers can apply secure media to almost any type of product or packaging, from branded goods to industrial parts. Secure media can lead to new processes that improve security and efficiency in production, inventory management and logistics. Here are a few examples of the role secure media can play in improving common operations.

Manufacturing

Marking items at the point of production allows for the most tracking and authentication benefits. Most products already receive some type of identification label, so using secure media makes it easy to add another level of protection. Making the move to secure supplies provides additional protection without adding cost or changing

processes. The diverse range of media offerings that support authentication technologies makes it possible to label goods at the item, packaging and shipping container levels.

Marking materials at the source enables product verification and auditing anywhere within the facility and within the supply chain. If products or subassemblies are labeled with intelligent media (such as magnetic threads, bar codes or RFID tags that carry data) early in the production process, the label can be read to capture production information, automatically track work-in-process, or interface with industrial controls for automated routing through assembly and testing processes. Variable information like test data, lot codes, operator ID, production and expiration dates can be encoded on the label to produce an audit trail without manual data entry.

Shipping & Receiving

Secure media can be combined with bar code labeling to improve shipping security and to guard against diversion. It is fairly common practice to scan a bar coded shipping label on each item that is being loaded for shipment. The scan initiates a database check to ensure every required item is included in the shipment. After the final item is scanned and loaded, a PC application can use the scan data to automatically create a bill of lading.

Secure media can enhance this application in two ways. Shippers could authenticate labels as items are being loaded to ensure improperly labeled goods or counterfeit materials aren't entering the distribution system. The container labeling application would be reversed for receiving operations. Labels would be read to authenticate the shipping container or packaging and ensure that counterfeit products had not been substituted while the shipment was in transit.

The second application is to print the bill of lading or other shipment documentation on secure media for authentication by the recipient. This practice would detect forged bills of lading used to disguise the loss of materials diverted in transit.

To further protect distribution channel integrity, manufacturers could take advantage of secure media labels on their products to inspect and audit distribution centers. Secure media would enable the fast and easy detection of fake goods being distributed through legitimate channels. Smart labels can be used like EAS tags to prevent shrinkage from storage facilities. Some media options are appropriate for use as packaging seals to add identification features to the anti-tampering functionality.

Retail

Shipping and receiving processes can be repeated when materials leave a distribution center for final shipment to retail or end-user customers. Retailers in particular should take time at receiving to authenticate merchandise because of the prevalence of counterfeit consumer goods. Manufacturers could audit retail stores to maintain channel integrity and detect entry points of diverted, stolen or counterfeit goods.

Secure media is a powerful deterrent to return fraud, which costs U.S. retailers $2 billion annually according to the National Retail Federation. Producing fraudulent receipts on unsecured media is well within the capabilities of dedicated criminals. Secure media, authenticated at point-of-sale stations with low-cost readers, would detect and prevent fraudulent "returns" of stolen merchandise. Secure media labels on the product itself could be used to verify authenticity and to detect counterfeits.

Service, Warranty and Lifetime Tracking

Secure media also provides manufacturers, retailers and service agents a convenient method to verify eligibility for warranty and service claims. Detection technology can authenticate the product, while identification technol-

ogy can provide specific product identification so warranty eligibility could be determined in the field without access to a records database.

A test equipment manufacturer uses smart labels to prevent expired or unauthorized supplies from being used in its machines. A smart label on each supply cartridge encodes the product type and expiration date. When cartridges are loaded, an RFID reader built into the machine authenticates the cartridge, checks the expiration date and performs calibration specific to the type of cartridge being used. The application improves machine performance by preventing calibration errors and the use of inferior materials, and is marketed as a value-added feature to the manufacturer's customers.

Product identification marking can limit manufacturer liability from counterfeit products. Bar code part marking for lifetime identification is used extensively by aerospace, automotive, telecommunications, electronics and computer manufacturers to verify eligibility for warranty and service claims and meet record-keeping requirements. Complementing the application with secure media safeguards against fake product ID labels.

In typical applications, the part's serial number, date of manufacture and other data are encoded in a two-dimensional bar code that is permanently affixed to the item. The part may be scanned during assembly to associate it with a specific assembly, which enables later detection of part swapping for unauthorized service claims. Any time repair, service or maintenance is performed on the part, the bar code is scanned and database applications verify the item's identity, eligibility and past service records, which can uncover suspicious patterns of activity. Scanning and automatic data recording is an efficient way to build accurate maintenance and history records, which are very valuable if liability questions ever arise. RFID has also been used for these applications and adoption should grow now that users can produce small, flexible smart labels on demand.

Label and Ticketing Applications

This white paper has focused primarily on how to protect products with secure media. The technology is also extremely beneficial when the media is the product, as in the case of tickets, gift certificates, license agreements and other documentation. Secure media is compatible with mobile printers, which is a boon to mobile ticketing and service applications in the transportation, gaming, hospitality and entertainment industries.

Ticketing and labeling applications for secure media include event tickets, claim checks, wagering slips, coupons, gift certificates, credit slips, visitor passes, media credentials, transportation passes and tickets, inspection labels and more. In addition, authentication labels can be created for placement on virtually any document or file folder.

Summary and Conclusions

Secure media is an extremely convenient and cost-effective way to protect brands, channels and margins. The variety of security media technologies, and the materials they can be applied to, gives manufacturers tremendous flexibility in designing authentication programs. Secure media fulfills other key requirements by being cost-effective enough to apply to all products or shipments and convenient enough for use at all levels of the supply chain. For organizations that already have any type of labeling system in place, the impact of secure media has on protection will far exceed the incremental expense.

Zebra Technologies offers a wide range of secure media and demand printing solutions, ranging from tamper-evident materials to user-programmable smart labels. Contact Zebra today to learn more about how our products and expertise can help enhance your security programs.

Notes

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