

# Protecting People, Products & Property with Identification Printing



A ZEBRA BLACK & WHITE PAPER





**Copyrights**

©2007 ZIH Corp. All product names and numbers are Zebra trademarks, and Zebra and the Zebra head graphic are registered trademarks of ZIH Corp. All rights reserved. All other trademarks are the property of their respective owners.

Unauthorized reproduction of this document or the software in the label printer may result in imprisonment of up to one year and fines of up to \$10,000 (17 U.S.C.506). Copyright violators may be subject to civil liability.



Fraud and theft are constant threats to businesses, and the protections put in place against them must constantly evolve. Identification printing solutions are both evolving and effective for helping organizations protect their people, property and products. Identification printing solutions include tamper-resistant bar code and radio frequency identification (RFID) labels for assets, shipping containers and products, plus secure receipts, documents, tickets, ID cards and wristbands that can be produced on demand to identify employees, visitors and patrons and manage their access to facilities, equipment and services.

This white paper describes these technologies and their applications. It will specifically address applications for protecting people, products and property, including:

- Access control, visitor tracking and personal security;
- Asset and equipment protection;
- Protecting products against diversion and counterfeiting;
- Document, receipt and ticket security.

The paper also provides information about additional resources and presents several real-world examples of how companies have benefited from ID card and label printing technology.

## Introduction


---

Every organization and consumer is affected by commercial crime, but few realize the scope. For example:

- Employee theft is responsible for 30% of all business failures according to U.S. Chamber of Commerce estimates.
- In 2006, 52.4 percent of U.S. retailers were burned by return fraud involving counterfeit receipts, according to the National Retail Federation (NRF).
- An NRF study found inventory shrinkage cost retailers 1.75 percent of annual sales, with losses from employee theft far exceeding losses from shoplifters.
- The U.S. Chamber of Commerce calculated that counterfeiting and piracy costs are directly responsible for more than 750,000 U.S. job losses, cost the U.S. economy between \$200 and \$250 million annually, and cost the global economy \$650 billion.

Automatic identification technology and identification printing systems can effectively limit the damages from these crimes. The U.S. Small Business Administration states, “Most successful embezzlement schemes would have failed if inventory and accounting records were organized and up to date.”

The best security is proactive, not reactive. By integrating security into processes and products, organizations can deter fraud and theft by making themselves unattractive targets for opportunistic criminals.



Identification systems are highly effective and visible deterrents that protect against many types of security threats. Identification and tracking systems can be used to protect people, facilities, fixed assets, products and information. They can also ensure product integrity and prevent fraudulent returns and service claims. Access control is only a starting point. Marking products, capital equipment and other assets with a bar code or RFID label is an especially good practice because it deters theft and tampering while also facilitating inventory control, asset management and recovery.

## Identification Printing Technologies

---

The identification printing technologies in this paper include card, label and mobile printers that are used to produce materials with bar code, RFID, magnetic stripe, smart card, graphics and photo security features. All the materials discussed in this paper can be produced on demand at the user's own facility with easy to operate equipment. Zebra also offers secure media and supplies to complement printing. Switching from preprinted security tags, labels, tickets and passes to on-demand identification printing systems provides an immediate benefit by removing the worries related to managing and securing stocks of valuable commodities.

A bar code is the most widely used data storage format for security printing applications, and RFID is the fastest growing. Common linear bar codes easily meet most needs for encoding employee and visitor identification, product serial numbers, tickets, document and file tracking numbers, asset labels, receipts and other data. Two-dimensional (2D) bar codes can encode significantly more text than linear codes and store digitized photos, graphics, fingerprint files and other biometric data. 2D symbols are also very effective for identifying small parts or products like jewelry or electronic components.

Smart labels are RFID tags embedded within an adhesive label for non-contact access. Read-write chips are available for applications that require stored information to be updated or for new data to be written to the tag. Smart labels can be secured so the tag serial number or other data can never be changed or erased, but other portions of memory remain available for read/write operations.

Smart cards contain a chip that can be accessed by contact or wirelessly via RFID. Smart card printers offer multiple encoding and security technologies, including holograms and magnetic stripes. The chips used in smart labels and smart cards can store many types and formats of data information including text, digitized photos and biometric files.

### Card Printers

Digital plastic card printers offer the ability to create custom cards ideally tailored to the application, right at the point of issuance. System administrators can invalidate lost or stolen cards and issue replacements immediately. Unlike ID card systems of the past that didn't allow customization or required time-consuming photo processing, cutting and laminating, today's digital printing systems permit completely automated production of highly customized, secure cards. A wide variety of card printers exist to meet user needs, including high duty cycle models for applications that require thousands of cards annually.



Digitally printed plastic cards provide numerous technological features, but start with a blank plastic card that can be customized with any combination of artwork, graphics, text, digital photographs, bar codes, logos and more. Additional machine-readable information, such as magnetic stripes and smart card chips, can also be encoded. The image quality of plastic photo ID cards produced with digital printing technology is far superior and tamper resistant compared to those produced through the traditional method of trimming printed photos and laminating them onto the card. Different card materials and laminates provide additional protection from tampering.

Magnetic stripe cards carry more data than standard bar codes, but require more expensive media. Card issuers stock blank magnetic stripe cards and encode them on demand. Smart cards can hold the most data of any medium discussed, up to 100 times more than a magnetic stripe card, and may also include a processor chip that enables multiple applications. Smart cards can be used to securely store monetary value, records and access privileges. The data encoding options, graphics capabilities and production speeds supported by desktop card printers also make them ideal for generating gift cards.

### **Label Printers**

Label printers are ideal for creating bar codes and RFID smart labels for asset identification, receipts, ticketing and document control, receipts and other documentation. Label printers typically can print multiple one- and two-dimensional bar code symbologies plus logos, graphics and text. Desktop label printers can accept various standard and secure media, including card, tag and ticket stock, durable synthetic materials for lifetime tracking, and low-cost paper and label stock in multiple sizes. Because label printers can use so many types and sizes of media, they are suitable for an incredibly diverse range of identification printing needs. Label printers can produce wristbands, hazardous material labels, temporary ID badges and visitor passes, event tickets, receipts, apparel tags, price labels, file and document identifiers, shipping labels and container IDs, inspection stickers and more.

### **Mobile Printers**

Mobile printers offer most of the same functionality as desktop label printers, but cannot accommodate the largest media sizes. This is rarely a limitation for security printing applications. Mobile printers may be worn or carried by the user or mounted in a vehicle, which makes them ideal for ticketing and inspection applications. Some mobile printers have integrated magnetic stripe readers and encoders, which expands the possibilities for security applications.

### **Secure Wireless Printing**

Many Zebra® desktop and mobile label printers can connect to wireless local area networks (wireless LANs). There is no need to deny the benefits of wireless printing because of security concerns, and no need to deviate from enterprise wireless security standards and policies to accommodate wireless printers. Zebra offers some of the strongest security protocols in the industry, including virtual private networks (VPNs), and WPA, WPA2, 802.11x, 802.11i, LEAP and others, and is continually planning enhancements to all its networking products. See Zebra's white papers *The Benefits of Wireless Printing* and *Securing Zebra Wireless Printers* for comprehensive information about security and other topics related to wireless printing.



## Security Applications

---

Many organizations use employee ID cards and access control systems to prevent unauthorized people from walking through their front doors. Unfortunately, most organizations suffer more losses from their own employees than they do from outsiders. Retail employees steal 50 percent more than shoplifters, according to the National Retail Federation (NRF). Businesses face even greater threats from white-collar crimes. Employee theft is responsible for 30% of all business failures according to U.S. Chamber of Commerce estimates. Pilfered office supplies and unauthorized use of photocopiers, scanners, digital cameras, color printers and other equipment may seem innocent, but these acts burden employers with higher service and operating costs and untold lost productivity. Organizations should carefully consider their access policies and protections, and how identification printing applications could improve them.

Expanding the use of personal identification systems for employees, contractors and visitors can protect organizations from these losses. ID printing systems can discretely enhance existing security measures and extend protection to additional areas, visitors, vendors, contractors and temporary workers.

### **Access Control**

Most losses aren't from overt break-ins or elaborate employee fraud schemes, but from simple crimes of opportunity. Limiting access to facilities, equipment and supplies can prevent a significant amount of transgressions. For example, the Renaissance Tower, a 56-floor office complex in Dallas, installed a Zebra ID card printing system that not only permits employees to enter the building, but controls access to specific floors with card readers on the elevators and stairways. After the ID cards replaced the honor system, the Renaissance Tower's director of security reported a "significant decrease in thefts" and an "80 percent improvement in operations."

In addition to limiting entry to specific floors, ID cards with bar codes, proximity chips, magnetic stripe or smart chips can be integrated with readers to control access to supplies, computer rooms, copy centers and equipment. For added security, vending machines can be made cashless with card readers for debiting or monthly billing. Without cash, machines aren't an attractive target for theft or vandalism. These added-security cards can be produced conveniently in-house with a desktop printer.

### **Visitor ID**

Companies can also extend their protection by issuing ID badges to visitors, temporary workers, service and delivery personnel and contractors. If plastic ID cards aren't desired, professional-looking visitor passes can be created quickly with compact, quiet label printers installed at reception desks, receiving docks or guard stations. A thermal label printer was installed in the lobby of the Aon Center in Chicago as part of an automated visitor management system that reduced lines by 86 percent. Tenants pre-registered expected visitors in the system using a Web application. Arriving visitors checked in at the reception counter, where a staff member consulted the software application, printed a secure visitor badge, and then notified the host of the visitor's arrival. Thermal printers support additional features and applications because they can incorporate graphics, security marks, bar codes and even encode digitized photos on low-cost adhesive labels, including expiring media that displays a "VOID" message a few hours after the pass is created.



## **Patron Tracking**

Automated visitor tracking also yields big returns at theme parks and attractions. Many water parks, amusement parks and other venues use RFID wristbands, produced on demand, for cashless payment and to manage access to rides and attractions. Venue operators who implemented these systems report increased security, improved crowd control and facility management through the use of unattended turnstiles and guest-tracking applications, plus increased customer spending facilitated by convenient cashless payment.

## **Patient Tracking**

Patient tracking is another high-growth area for ID wristbands. Patients in healthcare facilities are subjected to an estimated 770,000 medication errors annually, which cause up to 98,000 deaths, according to a study by the Institute of Medicine. Many other ID-related errors occur at outpatient facilities and labs. A highly effective safeguard against medication errors is to automatically identify the patient and medication dose prior to dispensing. The Department of Veterans Affairs (VA) reduced medication errors by 83.2 percent with such a system and later expanded it to all 173 of its hospitals. To encourage bedside scanning, the U.S. Food and Drug Administration (FDA) mandated that all pharmaceuticals dispensed in hospitals be marked unit-of-use bar codes by April, 2007. Wristbands can also be used for access control and to prevent patients from leaving the facility. RFID-based wristbands have been integrated with alarm systems to prevent baby abductions from maternity wards and to control wandering by Alzheimer's Disease patients. For more information on this topic, see the Zebra white paper *It's All in the Wrist: Improving Patient Safety with Bar Code Wristbands*.

## **Guard Tour**

Including key assets in daily guard tour inspections can detect and prevent theft or unauthorized borrowing, which improves asset availability and worker productivity. In common applications, permanent bar code or RFID labels are applied to locations and assets within a facility. Security guards read the tags with mobile computers as they make their rounds. The application helps ensure guards complete their rounds and encourages prompt detection of missing items, which improves the chances of recovery.


# **A s s e t   M a n a g e m e n t   A p p l i c a t i o n s**

---

Nearly every business relies on bar codes to efficiently manage product flow through its warehouses, yet relatively few follow the same principles to control core assets like capital equipment, tools, computers and supplies. The result can be untold losses from missing and underutilized equipment and unnecessary supply and replacement costs. Taking control of assets through automatic identification systems can be a powerful step to increased profitability.

## **Tool Crib & Supply Management**

Bar code and RFID labels are also very effective for managing authorized use of capital equipment, tools and supplies. First, automated employee ID cards can control access to storage locations. Equipment and supplies should have an ID label that is scanned prior to removal or issuance to an employee. Simple applications requiring a quick scan of the asset and the employee ID badge can verify that the employee has authority to use the asset, build an audit trail that associates equipment with users, and generate reports detailing supply usage that can flag unusual activity. Applications can be easily modified to cover items ranging from expensive test equipment to small tools and computer supplies. ID cards can also be used with automated dispensing equipment.



RFID labels are especially effective for unattended dispensing and security applications. Besides satisfying the identification requirements of the application, RFID labels can function similar to anti-shoplifting tags used in retail and sound alarms or activate locks if unauthorized removal is attempted. Bar code and RFID tracking can also be used to reduce losses from returnable containers and other assets that are transferred to customers.

### **Capital Equipment Management**

Identification labeling can also help secure large capital equipment like lift trucks, tow motors, test and diagnostic equipment, and medical devices. Labels used for asset management and inventory can also be combined with employee ID badges to authorize and record usage.

An ID system with a wireless network interface can check credentials stored on an employee ID card and either allow or prohibit operation of the equipment. This capability can also automatically associate individual employees with equipment, which is useful for monitoring, auditing and security.

Equipment tagged with RFID can be automatically tracked throughout the facility. This real-time location data can eliminate time wasted searching for equipment and improves asset utilization. Ultimately, operations may require fewer assets, which frees money for other investments. In an emergency, real-time tracking of medical devices can save lives by quickly locating personnel for evacuation or medical attention.

### **Library & Video Store Operations**

Many libraries around the world have implemented RFID labels to speed material check-in and checkout, shelf inventory and security operations. Low-cost flexible smart labels are applied to the book, video, CD or software and can be made invisible to patrons. Counter personnel can check dozens of books in or out in mere seconds and without manually handling and orienting each item. The tags can also be used for theft detection, much like anti-shoplifting technology used by retailers. Librarians using portable computers with RFID readers can take inventory and find misfiled materials simply by walking through the shelves. The reader can automatically detect specific missing materials and alert the operator.

Video stores use RFID for similar operations. Readers positioned at the checkout, unattended return boxes and doorways automatically record transactions and detect shoplifted items. The application can also help increase sales by automatically sending alerts when specific titles are returned. Clerks can immediately remove videos or games from drop-off boxes and rent them to waiting customers. Other rental and lending organizations can adapt these applications to meet their own needs.

### **Evidence Management**

The ability to link items with individuals is especially important for evidence management and other applications requiring audit trails. Labeling items with a bar code enables users to conveniently create accurate records of all item movements. Mobile printers can create bar code evidence labels at the crime scene for immediate and accurate identification and tracking. Once items are labeled, a quick bar code or RFID scan can record all handling and transfers with a time-and-date stamp. No manual entries into a ledger book or key entry into a computer system are required. See Zebra's Web site for examples of successful bar code-based evidence management systems used by various law enforcement agencies.





## Document & File Applications

---

Identification printing systems can create many types of secure documents ranging from highly secure boarding passes to retail receipts to raffle tickets. Bar code and RFID labels can be applied to file folders or documents themselves for tracking and authenticating. Bar codes are also commonly used on bills of lading, manifests, invoices, work orders and other documents to enable automated authenticity verification and processing.

Bar code and RFID labels also enable automated records management that improves security and productivity. Requiring employees to scan their ID cards can control access to records storage. Employees may also be required to scan documents or files prior to checking them out. The procedure greatly reduces lost files and the time spent looking for them by building an audit trail that links documents to specific employees. Bar codes and even RFID can be used to encode serial numbers and security marks that make forgery difficult.

### **Receipt Printing**

Petty criminals and sophisticated crime rings alike have carried out lucrative frauds based on counterfeit receipts. A criminal ring used fake retail receipts to bilk the Nordstrom department store chain out of \$140,000 in five states. Adding bar codes to receipts is an effective deterrent to return fraud. The well-known retailer is not alone: the NRF's inaugural return fraud survey in 2006 found return fraud based on counterfeit receipts was committed against 52.4 percent of retailers.


Receipts can be printed with bar code symbols that encode a unique tracking number that associates the receipt with a specific transaction in a database. The database application will not authorize forged receipts, because there is no corresponding transaction record. Database programming could detect multiple uses of duplicated receipts and provide other protections. Quality bar code printers and media are required to print secure receipts with long-lasting text, bar codes, logos and custom graphics. Secure media can also be used. These quality features make receipt counterfeiting more difficult and are a simple way for retail businesses to increase security.

### **Ticketing**

Many leading ticket agencies and entertainment venues have taken advantage of bar code security to offer customers the convenience of printing tickets on home computers. Others take advantage of mobile computers and printers with wireless connectivity to print tickets at convenient locations throughout the facility.

Encoding a unique control number on the ticket and validating it against a database at redemption can improve ticket security. The database check detects duplicate or counterfeit tickets. By including bar codes in their ticket designs, event organizers have enabled their customers order tickets online and print them at home. Bar code control protects against duplicate or fake tickets, and the application improves crowd control by easing lines at box offices and ticket counters. Card printers can be used to create event passes and season ticket holder identification that enable multiple applications.

For high-security ticketing applications like airline boarding passes, the ticket holder's digital photograph, fingerprint scan or other identifying information can be encoded into a two-dimensional bar code or RFID label for validation at various points prior to boarding. Passenger identification systems can also be integrated with baggage handling operations for automated baggage reconciliation.



Mobile printers make it easy and convenient to print secure bus and train tickets, property receipts, vouchers, betting slips and raffle tickets. Printing these materials on demand eliminates the need to secure and manage valuable ticket inventory. Users can take advantage of the bar code and quality graphics capabilities of mobile printers to design tickets that are legible, aesthetic, secure and difficult to duplicate.

## Product Protection

---

Identification is the best defense against product counterfeiting, which is the greatest security threat most businesses face. Counterfeiting and piracy cost the global economy approximately \$650 billion annually, according to the U.S. Chamber of Commerce. The pharmaceutical, technology, consumer goods, aerospace and auto parts industries are among the hardest hit. For example, the World Health Organization (WHO) has estimated 10 percent of the world's drug supply is counterfeit, and the Center for Medicine in the Public Interest predicts counterfeit pharmaceuticals will rise 13 percent annually through 2010. The global IT industry loses \$100 billion in annual revenue to piracy and counterfeiting, according to a study by the Alliance for Gray Market and Counterfeit Abatement (AGMA). Fake products and illegitimate sales channels damage every segment of industry. Identification printing can play a role in securing brand integrity and preventing theft.

### Authentication

Near-constant innovation is necessary for authentication, because materials and tactics rarely stay effective for long before counterfeiters learn to foil them. Layering multiple authentication technologies has proven effective, and RFID is emerging as a valuable and popular resource. See Zebra's white paper *Brand Protection in the Supply Chain: Protecting Products and Profits with Secure Media Solutions* for more information about thermal printer supplies that support authentication applications.

Unique and proprietary product identification information can be encoded into an RFID chip embedded within a product tag or label. RFID tags are inconspicuous, extremely difficult to counterfeit, and provide a hidden layer of security that can be checked automatically at every level of the supply chain. RFID authentication could be used to inspect products as they are loaded into shipping containers, or received at distribution centers by the retailer. Several standards and software applications based on the EPCglobal Gen 2 RFID standard have been developed to facilitate creation of electronic pedigrees for products and authentication. The pharmaceutical industry has embraced Gen 2 technology, with several major manufacturers and wholesalers announcing EPC-based pedigree programs. RFID-based security is readily adoptable to the food industry and others with product tampering or supply chain integrity concerns.

### Anti-diversion

Applying smart labels and other secure media to items, pallets and shipping containers can also be a major deterrent to shrinkage and product diversion at all points in the supply chain. RFID also helps manage returns of reusable assets like pallets, totes and kegs, which reduce losses and asset costs. Bar code, RFID and mobile computing technology can be combined to ensure that the right items and quantities are packed into cartons and cases, and that the cases are loaded into the correct shipping containers.



Smart labels can be applied to shipping containers, multi-packs or individual items to serve as an enhanced EAS tag that triggers alarms if items are physically removed from the containers or facility. To protect against theft and diversion in the supply chain, RFID labels can detect and prevent unauthorized item removals from trucks, warehouses, yards and other storage areas. Because RFID readers can process dozens of tags simultaneously and don't require direct line of sight, the entire contents of a pallet or other shipping container can be verified in seconds, with limited or no labor required.

Electronic article surveillance (EAS) systems are a staple to combat shrinkage in retail stores. Smart label RFID technology enables retailers to extend this protection to their back rooms and distribution centers, where the biggest losses occur. Readers can be placed at receiving docks, back doors and other entry and exit points to discretely guard against employee theft.

### **Service & Warranty Tracking**

Product identification marking can limit manufacturer liability from counterfeit products. Bar code part marking for lifetime identification is used extensively in the aerospace, automotive, telecommunications, electronics and computer industries to verify eligibility for warranty and service claims and meet record-keeping requirements. In typical applications, the part's serial number, date of manufacture and other data is 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 product, which enables later detection of part swapping for unauthorized service claims. When repairs, service or maintenance is performed on the part, the bar code is scanned and database applications verify identity, eligibility and past service records, which can uncover suspicious patterns of activity. The scanning and automatic data recording help efficiently build maintenance and history records, which provide valuable documentation if liabilities ever arise. RFID can also be used for these applications and adoption should grow now that users can produce small, flexible smart labels on demand.

## **C o n c l u s i o n**

---

Identification printing systems offer many easy and inexpensive ways for organizations to raise the level of protection for their people, products and property. Raising the bar on security prevents many problems by leading opportunistic perpetrators to seek easier targets. This paper provided brief overviews of how bar code, RFID and card printing can provide a variety of protections. Visit Zebra's Web sites, [www.zebra.com](http://www.zebra.com) and [www.zebracard.com](http://www.zebracard.com), for additional related white papers and case studies about successful ID card programs and printing applications for evidence and facilities management, supply chain improvement, product identification, parking enforcement and ticketing, and more.

Zebra Technologies Corporation (NASDAQ: ZBRA) delivers innovative and reliable on-demand printing solutions for business improvement and security applications in 100 countries around the world. More than 90 percent of Fortune 500 companies use Zebra®-brand printers. A broad range of applications benefit from Zebra-brand thermal bar code, "smart" label and receipt printers, and plastic card printers, resulting in enhanced security, increased productivity, improved quality, lower costs, and better customer service. The company has sold more than five million printers, including RFID printer/encoders and wireless mobile solutions, as well as ZebraDesigner™ software, ZebraLink™ connectivity solutions, Genuine Zebra™ printing supplies and ZebraCare™ services. Information about Zebra specialty printing solutions is at [www.zebra.com](http://www.zebra.com).



**GLOBAL/AMERICAS**

**HEADQUARTERS**

Zebra Technologies Corporation  
333 Corporate Woods Parkway  
Vernon Hills, IL 60061-3109 U.S.A.

T: +1 847 793 2600 or  
+1 800 423 0442  
F: +1 847 913 8766

**EMEA HEADQUARTERS**

Zebra Technologies Europe, Limited  
Zebra House, Unit 14,  
The Valley Centre  
Gordon Road, High Wycombe  
Buckinghamshire HP13 6EQ, UK

T: +44 (0)1494 472872  
F: +44 (0)1494 768251

**ASIA-PACIFIC HEADQUARTERS**

Zebra Technologies Asia Pacific, LLC  
16 New Industrial Road  
#05-03 Hudson TechnoCentre  
Singapore 536204

T: +65 6858 0722  
F: +65 6885 0838

**OTHER LOCATIONS**

**USA**

California, Rhode Island, Texas,  
Wisconsin

**EUROPE**

France, Germany, Italy, Netherlands,  
Poland, Spain, Sweden

**ASIA-PACIFIC**

Australia, China, Japan, South Korea

**LATIN AMERICA**

Florida (USA), Mexico

**AFRICA/MIDDLE EAST**

India, Russia, South Africa,  
United Arab Emirates