

## Feature Article

### EAS Source Tagging 20-Plus Years of Innovation

Written by Robert L. DiLonardo

Every so often, a simple idea catches the imagination, fervor, and engagement of a group of people and is developed into a successful practice that revolutionizes a business. Electronic article surveillance (EAS) source tagging is definitely one of those.

This story commemorates the evolution of source tagging with The Home Depot USA's 1994 signing and execution of the world's first contracts committing to the protection of merchandise with a disposable EAS label procured and affixed directly on the merchandise solely by consumer-products manufacturers or their packagers, rather than by in-store labor. That year about 70 million EAS labels were purchased by a few brave consumer-products companies who had been persuaded to participate by Home Depot's senior merchandisers, operations, and loss prevention management. Almost simultaneously, BJ's Wholesale Club completed the same process.

These rollouts, and those following closely thereafter, were the culmination of years of oscillating momentum shifts, frenzied product development, cutthroat competition, legal battles, moral suasion, testing and re-testing, apathy, and resistance. The sweat, tears, and eventual cheers wrought significant changes in the way loss prevention practitioners battled shoplifters. More importantly, source tagging stimulated profitable cross-functional cooperation among business partners that flourishes in retail to this day.

At the outset consumer-products manufacturers generally looked upon source tagging as another costly task forced upon them by their customers. With the help of the EAS vendors, the retail community began the long process of crafting the arguments that would elicit the proper level of support. There were a couple of notable instances where decisions were forced by ultimatum. As the hoped-for benefits began to materialize, the dynamics changed for the better, and the "oar pulling" among stakeholders synchronized. The disparate groups coalesced around processes that have revolutionized retail logistics, merchandising, and loss prevention practices over time. The end result is added value to the consumer (less negative impact of theft on pricing and selection) and to manufacturers, packagers, and other value-added resellers (stronger partnerships with retailers mean more shelf space and more reorders).

This legacy of understanding and cooperation has been noted, transferred, and improved upon by the organizers of "next generation" collaborative efforts in the retail logistics chain, such as the work of GS1, its forerunners, and collaborators.



**“What you do is move to ‘source embedding’—incorporating an anti-shoplifting device into the product.”**

The late Arthur J. Minasy, founder and chairman of Knogo Corporation as quoted from a New York Times article called “Putting the Tag on Shoplifters” published in May 1993

## Three Visionaries

The original EAS premise was to protect merchandise in stores electronically in order to identify a potential theft via an alarm; and then to assess the situation and respond accordingly. Source tagging has altered thieves' behavior and changed the in-store premise from active apprehension to passive deterrence.

The story begins almost fifty years ago with three men who each had a similar dream, started the EAS industry, and competed against one another tooth and nail for decades.

**Knogo.** The original RF EAS prototype system was designed in the mid-1960s under the leadership of Arthur J. Minasy, who set up a company called Monere Corporation, which later changed to Knogo Corporation. Knogo went public in 1972, and eventually developed or acquired three EAS technology types—RF, EM, and microwave. For many years, Knogo was acknowledged as the second-largest EAS manufacturer in terms of sales. An example of the original tag design was placed in the Smithsonian Institution's Museum of National History in 1991.

In 1992 Knogo developed and patented an EM thread it called the "SUPER STRIP." Released only in Europe, this product could be deactivated on contact—a key component for source tagging. Unfortunately, Minasy was diagnosed with cancer and in 1993 passed the reins as CEO of Knogo to the capable hands of long-time right-hand man Thomas A. Nicolette. After Minasy's passing, Knogo's non-North American operations were sold to Sensormatic Electronics Corporation in December 1994, after a competing offer by Checkpoint Systems was withdrawn.

Due to the intervention of the U.S. Federal Trade Commission, with a concern about potentially monopolistic practices in source tagging, North American operations were spun off to the former Knogo Corporation shareholders in the form of a new entity called Knogo North America, which listed on the American Stock Exchange in January 1995. "The deal included a 10-year consent decree allowing Knogo NA to keep the rights to the SUPER STRIP," recalls Nicolette, who remained CEO until 1999. "This provided us with a product that helped us compete successfully for source-tagging customers in a couple of very important markets."

**Sensormatic.** In 1966 Ronald G. Assaf, his cousin, and researchers from the University of Michigan developed an EAS prototype founded upon technology of an ultra-high frequency called "microwave." Assaf subsequently founded Sensormatic (now part of Tyco Retail Solutions), which became the largest manufacturer and marketer of EAS products in the world—around \$1.1 billion per year in sales at its apex. The basic circuit of a microwave EAS tag or label employs a diode coupled to one microwave and one electrostatic antenna. Early on Sensormatic manufactured its own diodes and antennas and laminated the circuits to be either inserted into reusable EAS tag housings or affixed directly to apparel with plastic barbs or pins with locks.

In those formative years, Sensormatic and Knogo competed against each other mainly selling or leasing detection systems into the apparel market—the first category of retail merchandise targeted by their sales forces. Knogo was having some success selling to smaller boutiques and specialty stores, while Sensormatic targeted large department stores and specialty apparel chains. Sensormatic's big breakthrough came in the



**"From day one for Sensormatic, the concept of applying tags at the point of manufacture was our goal. In practice all early Sensormatic systems employed paper tags disguised as either price tags or washing instruction tags."**

**Ronald G. Assaf,  
founder, former  
chairman, and CEO of  
Sensormatic  
Electronics Corp.**

early 1970s when Bloomingdale's department store in New York City and Famous-Barr in St. Louis ran successful trials of the system and agreed to install them. With two well-known stores as clients, other retailers were more willing to install the system, and sales began to rise. Sensormatic's first profitable year was 1973. Sales reached \$3.8 million, and earnings were \$191,000.

Around 1981 Sensormatic commercialized a disposable, deactivatable, adhesive-backed microwave EAS label called a "Sensor Label." Deactivation could be achieved only with contact from a hand-held, powered device that effectively deteriorated the diode, rendering the label unable to produce a return signal. These labels were large (about 4 by 5/8 inches), costly, and time consuming to deactivate because the prongs of the deactivator had to be placed properly in a special position on the label face. A few million were sold, but Sensormatic stopped marketing them in the mid-1980s.

Recognizing that neither its flagship microwave nor its newly developed electromagnetic technologies would be able to provide a marketable, deactivatable EAS label, Sensormatic embarked on a joint venture, called Identitech, in 1986 with Allied-Signal to manufacture and sell a new EAS system based on an Allied-Signal development called Metglas® amorphous ribbon technology.

The new system, described as "acousto-magnetic" (AM), was touted in the press releases as unique to the industry, in that it was capable of protecting exits at more than twice the width of competing systems and was virtually immune from false alarms. The 50-50 deal included exclusivity for Sensormatic in the retail security market. By 1987 they had developed a proof of concept for a label that was easily deactivated. In July 1988, Sensormatic bought Allied-Signal's half ownership. By then, Ultra\*Max, as it had been branded by Sensormatic, generated about \$5 million in sales.

The deactivatable AM label contains Metglas and a bias magnetic strip. They could be deactivated by the "touch" of magnetic material, resulting in a decrease in the magnetic properties of the bias strip through a process known as "degaussing."

Early in 1994, Sensormatic and Paxar Corporation, the world's largest fully integrated manufacturer of fabric labels, paper tags and tickets, and apparel brand-identification products, formed a joint development program to design, develop, and market combination brand identification/EAS products that could be "sewn in" or heat-sealed onto fabric in apparel manufacturing plants. Paxar and Avery Dennison developed encapsulation techniques, such as a "pouch" in a care label, allowing for the EAS label to remain a permanent part of the garment. Subsequent to the development efforts, successful testing took place at Venture Stores, Target, and Ashley Stewart. Eventually, other retailers adopted the practice, most notably Ann Taylor and J.Crew.

**Checkpoint.** Originally incorporated in 1969 as a wholly owned subsidiary of packaging company Logistics Industries Corporation, one of Checkpoint's first target markets was to provide security to libraries. From there, Checkpoint followed Sensormatic and Knogo into retail security. Albert E. "Ted" Wolf recognized that a focus in security held far more promise than the packaging business, so when sales reached \$3 million in 1977, he spun Checkpoint off, distributed the company's common stock to Logistics' shareholders, and became the company's first CEO.

In the mid-1980s two patents were awarded for resonant, deactivatable labels and a deactivator for use in an RF technology. Checkpoint acquired a sublicense to the intellectual property, and by 1986 Checkpoint was marketing an EAS system that included a detection system, deactivatable labels, and the Counterpoint® deactivator based upon those designs.

Checkpoint expanded its business both domestically and internationally through acquisitions, internal growth using wholly owned subsidiaries, and the utilization of independent distributors. In June 1993 as part of the settlement of a false advertising lawsuit filed by Sensormatic against Checkpoint, Sensormatic discontinued its agreement to sell Checkpoint products via Automated Security Holdings in Europe. The next month, to forestall a loss in European sales, Checkpoint acquired Dutch makers of security products and services, ID Systems International B.V. and ID Systems Europe B.V., which gave them direct access to six Western European countries, including The Netherlands, United Kingdom, Sweden, Germany, France, and Belgium.

Kevin Dowd became CEO in 1995, and the company grew by acquisition, moving into Japan by acquiring a one-third stake in Tokai Denshi Co. Ltd. (Tokai), a manufacturer of disposable RF EAS labels. In late 1995 the company purchased from ADT (UK) Limited all of the capital stock of Actron Group Limited, a wholly owned subsidiary of ADT. Actron manufactured, sold, and distributed radio-frequency electronic security systems to the retail industry throughout Western Europe. They also had a patent on deactivatable RF EAS labels that became the subject of a well-publicized, patent-infringement lawsuit, which Checkpoint eventually lost. Checkpoint bought the rest of Tokai in 1998.

In December 1999 Checkpoint acquired Meto AG, a German multinational corporation and a leading provider of value-added labeling solutions for article identification and security (EM and RF EAS labels). The acquisition doubled revenues and provided an increased breadth of product offerings and global reach.



**"This is such a powerful concept that if we get close to our vision of source tagging, we will be very successful."**

Attributed to Albert E. (Ted) Wolf, founder of Checkpoint Systems, as recalled by Dave Shoemaker, former group vice president, responsible for source tagging.

## Why Source Tagging?

It seemed like a "no brainer" to the people like me, who sold EAS for a living circa 1981. The early EAS adopters quickly realized that affixing tags and labels using in-store labor hours was inefficient and expensive labor resource allocation. Almost from the outset, apparel retailers began tagging operations in store receiving dock areas and one step back into the logistics chain—their own distribution centers—the original "source." The same situation existed with disposable EAS labels in the drugstore market and would also be used in the entertainment industry on video and audio tapes, CDs, and DVDs.

Store operations people squawked at the cost and lost productivity of using sales associates to affix tags. The sales people did their best to minimize the objection, but the EAS manufacturers ended up investing in time-and-motion studies to calculate tagging and removal rates to demonstrate that the expense was "minimal." This impediment to successful selling caused the vendors to develop strong theoretical arguments in favor of source tagging. Among the most forceful arguments were:

- Integrates with floor-ready programs, foreclosing the inevitable queues of merchandise waiting for an EAS tag before being placed on the selling floor.
- Facilitates the protection of high-risk merchandise, preserving the heart of a merchandise assortment, lowering shortage, and resulting in incremental sales.
- Introduces open merchandising opportunities, resulting in incremental sales and more customer convenience during the shopping experience.
- Relocates tag procurement and tagging costs to a more efficient place in the supply chain.
- Eliminates or drastically curtails in-store tagging labor expense and misallocated productivity.
- Redirects sales associates away from non-customer-centric activity to activities that drive shopper experience and satisfaction.

These reasons still apply. Today, source tagging remains as much a driver of sales as it is a shortage management tool.

## The EAS Selection Process

**Which Technology?** Boiled down, the laws of physics play a large role in steering the selection of the EAS technology that best fits a retailer's store configuration, merchandise mix, and business model. Without getting into detail, the EAS vendors competed with vastly different technologies.

Sensormatic featured AM, with its very low frequency, offering the ability to transmit and receive at greater distances between pedestals and to overcome outside "signal masking" influences like ferrous metal and water. The properties in the three-dimensional tag circuit were unique enough to provide immunity to false alarm—a key feature. Deactivation and reactivation occurs through a change in the polarity of the magnetic field.

Checkpoint featured a mid-range RF frequency that was more suited to its strategy to focus on paper labels with non-permanent circuits. RF also features a flat, but larger surface area, which is arguably easier to affix. These circuits are orientation-sensitive when passing through the pedestals, so detection rate comparisons generally favor AM. RF's energy-burst, short-circuiting methodology for deactivation provides more trouble-free POS throughput, due in large part to the superior detection range and versatility of its deactivator products.

Knogo developed RF and EM technologies that were preferred in video rental stores. EM was destined to be eliminated from source-tagging contention during the battle for the entertainment market segment.


For example, in making the basic technology choice, Home Depot analyzed the technologies and realized that the positive aspects of the physics supporting Sensormatic's AM meshed with the exigencies of its business model—wide exits in the garden and lumber departments, the use of forklifts and all-metal trolleys, and high-ferrous metal content in much of the high-risk merchandise.

On the other hand, another rather early adopter, Target Stores, conducted the same type of evaluation and concluded that the physics of RF conformed more rationally to its business model, and chose to employ Checkpoint RF. And the "fun" began.


**How Much to Use and Where to Put It?** The answer here seems simple, but it is anything but. Source tagging imposes its own inviolable rule—one EAS technology in all stores, no exceptions. This mandate challenges the traditional, fact-based selection methods, such as external-theft risk assessments or individual store ROI analysis.

Back then, EAS hadn't reached the pinnacle of its popularity. Before source tagging, the initial decision to use EAS was usually forced by inventory shortage crisis situations, identified at inventory time, in one or more stores in the chain. During the decision-making process, management evaluated technological options, external-theft risk profiles, costs, and all the other issues associated with EAS. As more stores hit the crisis

# RFID AND CELEBRATING 50 YEARS OF EAS



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point, more equipment would be procured as finances permitted. Stores that maintained low shortage were rarely candidates for EAS because the cost couldn't be justified.

**Source Tagging Changed this Logic.** The investment in EAS and the source-tagging process will benefit the entire chain. The tagging process forces low-volume, low-shortage stores to participate even though the individual investment would not be justified. An imperfect analogy would be the installation of new POS terminals. Every store gets them because of the new hardware's enterprise value.

This conundrum wreaked havoc on efforts to set a single EAS technology standard, which still hasn't happened.

## Beating the Drum for Source Tagging

In the early 1990s Checkpoint and Sensormatic established special departments and hired their first employees focused solely on describing and promoting the features, functions, and benefits of source tagging. Checkpoint's was called Impulse@. In short order they organized annual multiday meetings called Impulse@ Source Tagging Conferences. In mid-1992 Sensormatic established its Universal Product Protection (UPP) department and hired its first dedicated employees for the same purpose. They, too, established a member-based trade group called the Source Tagging Council that first convened around 1994.

Invitees to these conferences included retailers that were current or prospective implementers of source tagging, participating (or interested) manufacturers, packagers, and value-added resellers, who were starting a cottage industry by inventing security products for specific items or categories of merchandise that could be source tagged. Agendas usually included keynote speakers on strategic issues, workshops on "how to source tag," presentations on successful rollouts or applications, classes on tag-placement techniques, and roundtable discussions on what needed to be accomplished in the future. Both groups also set up testing laboratories that assisted users in tag-placement selection and other issues that optimized the source-tagging experience.

The EAS business began to expand rapidly. Eventually, these groups were expanded globally, often led by VP-level executives.

Most, if not all, of the conventional retail trade organizations established subcommittees and working groups to study source tagging and come up with guidelines and recommendations for their memberships within the context of their own unique requirements. The first industry-wide retail committee established to promote source tagging was called Industry Direction on EAS (IDEAS). It was established in 1990 and was comprised of retailers and consumer-products manufacturers. The group was the prototype for the Sensormatic-sponsored Source Tagging Council.

Other trade groups followed suit. Virtually all of the major groups started their own research efforts. Major participants included the forerunners of the National Retail Federation (NRF) and Retail Industry Leaders Association (RILA), National Association of Chain Drug Stores (NACDS), the aforementioned NARM and CPMA, the Food Marketing Institute (FMI), the National Sporting Goods Association (NSGA), and the Voluntary Interindustry Commerce Solutions (VICS) Association.

The Home Center Institute (HCI) published a thorough, well-reasoned Source Tagging Feasibility Study in 1993. A tremendous amount of organizational work and consensus emanated from the leadership in these groups. Their impact on the eventual success of source tagging cannot be overemphasized.

## Innovation on the Fly

The lack of a single technology standard caused turmoil and lawsuits, but the resulting competition engendered "fast and furious" product development projects for all of the competitors. The vast majority of the development was successful—yielding the features and functions required by the customers.

"Sell what you have" is an axiom in sales and marketing. It relates to the dangers of "jacking up" the expectations of potential customers without having the products to back up claims. Nothing good follows from over-promising and under-delivering. Much of the frenzy in the EAS industry circa 1990 to 1994 was concentrated behind the scenes in the offices of EAS product managers and in the engineering labs.

As the EAS marketing people successfully convinced retailers to install EAS and CPGs to attempt source tagging, early adopters found out that none of the competing technologies were fully ready for the complexity of source tagging. "We had to innovate to make the tagging go faster," said Seth Strauser, senior director of global product management, consumables, for Checkpoint Systems.

As it always is with new product development activities, designing then developing usable features in response to urgent customer needs takes talented engineers, vision, fortitude, and more than a little luck. Not every project goes according to plan, nor do they all get commercialized successfully. Sure, competitors each offered pedestals, labels, tags, deactivators, and the other necessary accessories that had been battle-tested over the years in conventional in-store tagging scenarios.

But, how well would the products work in an environment in which each new prospective rollout exposed unsolved issues and challenges? "I remember thinking that whoever won the source-tagging battle would win the war," said Mark Krom, former product management executive with Sensormatic.

The requirements for source tagging a wide range of merchandise were much more complex than conventional EAS—demanding performance that matched up to the standards imposed by the manufacturing and packaging methods and practices. Similar situations existed in regard to deactivation and scanning. How would the deactivation of EAS labels concealed inside packaging impact the POS process, for example?

I interviewed several product management and engineering executives from both Checkpoint and Sensormatic. All of them related stories about product development "fire drills," deadlines, long hours, lots of travel, and unbelievable pressure to perform. They were jovial about it with me. A twenty-year time passage has a way of mellowing one's perspective. But, I could still detect the urgency in their voices, even after all this time. The tension and pressure must have been, at times, unbearable, which is hard to convey in words on a page.

Here are a few of the most important innovations—most of which were "back-filled" after near catastrophes with early-generation products. The stakes were enormous. Neither group of people could afford to fail. And neither did.

**Under Floor System.** Around 1993 one of the "make or break" issues that stood in the way of convincing Home Depot to commit to a rollout was the effective coverage of the "lumber door" and the garden center. These exits were too wide for conventional pedestals, and the garden center exit was outdoors. The winner of this business would have to design an in-floor system that would work properly even though it was ensconced in concrete and surrounded by rebar (ferrous metal that would interfere with detection).



Sensormatic turned to Kathie H. Bulson, an engineering executive who joined them directly from the original Identitech team acquired from Allied Signal. Bulson and her team had been working on a similar project in the department store market, in order to protect wide mall exits. The critical element was the design of a transceiver—a combined radio transmitter and receiver. After a few tries, the group managed to provide a system that provided detection about 1.5 feet off the ground. While not spectacular detection, it was sufficient to help Home Depot make a positive decision. During the eventual rollout, teams of installers cut the floor and rebar, installed the transceiver, and covered it with the same quick-drying concrete used on airport runways.

**"Proximity" Deactivation.** Impact at the POS terminal is undoubtedly the biggest concern a retailer faces in a decision to implement EAS. Apparel retailers had been able to live with a certain amount of extra work affixing and removing plastic tags, but most high-transaction volume retailers would not. Slowing down the POS was a deal breaker. Contact deactivation was not an option, so microwave and EM EAS were eliminated from consideration for source tagging. Deactivation at distance was critical. From the outset, the RF deactivation methodology was unquestionably superior to AM in this regard.

Checkpoint worked on improvements to deactivator electronics to enable the device to transmit enough energy to deactivate the labels. They routinely touted deactivation field heights of 10 to 14 inches above the deactivator.

Sensormatic's first proximity deactivation product, called the Speed Station, deactivated labels as merchandise was placed in shopping bags at the end of a POS checkout lane. It proved bulky, heavy, and expensive. So a smaller deactivator, called a Rapid Pad, was introduced in 1992 in direct response to the rapidly evolving distance deactivation requirements required by retailers. The deactivation field height topped out at only about 4 inches, marginally ample to support effective POS processing of tags placed near the barcode. However, each Rapid Pad cost more than most retailers would pay, so Sensormatic immediately began a value engineering exercise to remove cost and hopefully to improve performance.

Comparatively speaking, Sensormatic's deactivation methodology wasn't easily integrated into the POS as was the competition's, but the Rapid Pad enabled the Home Depot initiative, keeping Sensormatic in the game. Profound changes to the Rapid Pad's performance took place around 1999, when the AM label was reengineered to reduce cost, improve deactivation performance and range, and provide easier integration within the POS environment.

**Integrated Scanning/Deactivating.** The next logical step at POS was integration of barcode scanning and deactivation. Both companies saw this as crucial to long-term success and invested lots of time, effort, and resources to collaborations with scanning and scale equipment manufacturers. Checkpoint had the jump on Sensormatic and earned patents on integrated and simultaneous scanning and deactivation. In the beginning Sensormatic had to be satisfied with a two-step process whereby the AM label was deactivated first, and then the barcode was scanned.

**Label Performance Issues.** EAS labels are not simple structures. Both types are layered with paper, adhesive, plastic, and metals. AM labels have six or seven different components, and RF labels even have a silicon chip. The move toward source tagging identified new issues that required the EAS label vendors to completely revisit label design, manufacture, and formatting, thus changing the way they were supplied to the third parties who would undertake the source tagging.

Checkpoint's original RF label offerings were comparatively large in surface area and not designed for high-

speed auto-application. So, reengineering, in concert with improvements to system electronics, allowed them to eventually reduce the size of the primary source-tagging label from 1.5 inches square to about 1.3 inches square. This provided much greater breadth in tag placement options.

More importantly, however, was the requirement to provide label formats (roll sizes, widths) that manufacturers and packagers could use in their high-speed operations. An unintended consequence of the high-speed labeling was the effect that electrostatic discharge had on the RF EAS circuits. Static killed labels. By 1998 Checkpoint designed a release liner with properties that mitigated the static.

Finally, Checkpoint and the other RF EAS label manufacturers had to deal with the dreaded "Lazarus Effect" in which a previously deactivated label come back to life—wreaking havoc at store entrances as they set off unwanted, in-bound alarms. It took a long while, but continuous development efforts have succeeded in minimizing this issue.

Sensormatic had similar issues. The original AM label was thick (2.5 mm) and capable only of deactivating at about 4 inches off the surface of the pad. Customers were complaining, and management knew that they needed to do something fast. Around 1995, Mark Krom headed a "SWAT team" comprised of materials and manufacturing engineering talent, who spent the next nine months racing to reduce the label's size and improve deactivation height. The exercise led to changing most of the label's seven components and resulted in a 50 percent decrease in both height and width. One of the changes resulted in an increase in deactivation height to between 6 and 7 inches. Most customers deemed this height to be acceptable in the normal course of POS activity.

Label formatting issues plagued Sensormatic, too. At first labels were produced on rectangular sheets that are totally unsuitable to high-speed, auto-application methods. Checkpoint's experience proved that CPGs and packagers needed rolls, so Sensormatic developed those formats and even designed robotic equipment that placed the labels on the rolls. Another crisis averted.

These product development exercises were instrumental in the signing of marquee customers, such as The Wiz, Circuit City, Rite Aid, Target, Home Depot, BJ's Wholesale Club, and Walmart, along with their manufacturing and packaging partners. They demonstrated to the customer base that the EAS vendors were committed to developing the product functionality that would ensure the long-range success of source tagging. It was fun to watch, but difficult to live through if you were on the inside.

## **The Rest of the Story**

After 4,500 words we're only halfway through recounting the twenty-year history of source tagging. In part two, scheduled for the March/April issue, we'll examine how retail trade groups worked to establish an open standard. We will hear from early adopters and landmark customers who drove the source-tagging initiative, as well as review the issues that concerned the early doubters. Finally, we'll consider the source-tagging legacy.

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