For more information on our products:
www.honeywellaidc.com
800.582.4263

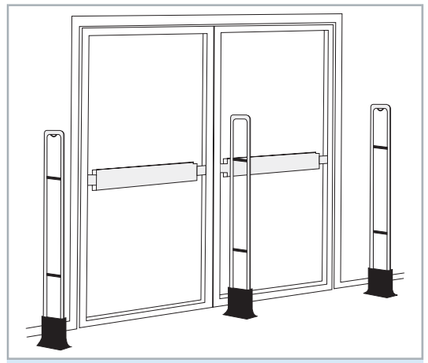
Honeywell Security & Data Collection
Honeywell Scanning & Mobility
700 Visions Drive
Skaneateles Falls, NY 13153

90 Coles Road
Blackwood, NJ 08012
www.honeywell.com

Honeywell

Honeywell

Electronic Article Surveillance (EAS) and Bar Code Scanning



Executive summary:

Electronic article surveillance (EAS technology) is used primarily in retail environments to prevent the unauthorized removal of items from a store

There are three main types of EAS systems on the market—radio frequency (RF), electromagnetic (EM) and acousto-magnetic (AM).

An Overview Of Electronic Article Surveillance (EAS)

Introduction

EAS is a technology used to identify articles as they pass through a gated area. This identification is used to alert someone that unauthorized removal of items is being attempted. EAS systems are useful anywhere there is an opportunity for theft of items of any size. The primary environment for an EAS system is retail stores; however, an increasing number of warehouses and distribution centers are installing the equipment.

Three types of EAS systems dominate the retail industry: radio frequency (RF), electromagnetic (EM) and acousto-magnetic (AM). A fourth technology, microwave (MW), was the first technology used for anti-theft systems and is far less reliable and accurate than the three aforementioned systems. In each technology, an EAS tag or label is attached to an item. The EAS tag/label is in an active state when guarding against product theft. When in the active state, a tag will sound an alarm if passed through the detection field located between EAS pedestals.

At checkout, the EAS tag/label is deactivated or placed into an inactive state where it will not flag the alarm. If it's a reusable tag, the cashier will use a detacher to remove the tag for placement onto another store product. If it's a disposable paper label, it can be deactivated by swiping it over a deactivation pad or a bar code scanner that has an integrated EAS component. If the item has not been deactivated or detached by the clerk it will sound an alarm when carried through the detection gates at the store exit.

The type of EAS system dictates how wide the exit/entrance aisle may be, and the physics of a particular EAS tag and technology determines which frequency range is used to create a surveillance area. The following three sections outline the primary technologies used in EAS systems.

How Do Radio Frequency EAS Systems Work?

Radio frequency (RF) systems are one of the most widely used systems in the world—closely matched by acousto-magnetic (AM) systems that will be discussed later. The basic idea is that the tag has a helical antenna etched from thin aluminum bonded to a piece of paper. At the end of the antenna is a small diode or RC network that causes the tag to emit a radio signal in response to the radio signal it receives. Referencing the diagram below, you can see that an RF system works as follows:

1. An RF EAS label, an electronic circuit and antenna, is attached to a product.

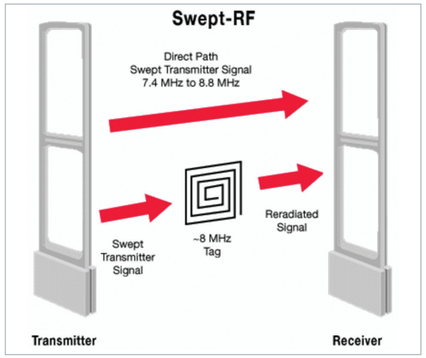
2. A transmitter pedestal emits a specific frequency

3. The EAS label responds to the transmitted frequency

4. The response from the label is then picked up by the adjacent receiver pedestal

5. The response signal is then processed by the system and will trigger an alarm if it matches specific criteria.

The distance between the two gates can vary, but on average is not much more than two meters (2m). Operating frequencies for RF systems generally range from 2 to 10 MHz. Most of the time, RF systems use a frequency sweep technique in order to deal with different label frequencies. To disarm the tag, a strong RF pulse blasts the tag and burns out the diode or RC components, thus eliminating response signals between the gates.



Sometimes both the transmitter and receiver are combined in one antenna frame—these are called mono systems and they can apply pulse or continuous sweep techniques or a combination of both. Mono systems are effective if a store's entry is small. The mono system is used with hard labels, which are slightly more expensive than paper labels used with RF sweep techniques.

It is technically possible to create an invisible system by installing an antenna loop around a store's door or even through the ceilings and floors of a store. These installations are more costly to install in pre-existing building structures, and tests have shown that the preventive value of a visible system is greater and results in a greater decrease in theft.

How Do Electromagnetic EAS Systems Work?

The Electromagnetic (EM) system, primarily used in Europe, is used by many retail chain stores, supermarkets and libraries around the world. In this technology, a magnetic, iron-containing strip with an adhesive layer is attached to the merchandise. This strip is not removed at checkout—it's simply deactivated by a specific highly intense magnetic field. One of the advantages of the EM strip is that it can be re-activated and used at a low cost. Referencing the diagram below, an EM EAS system works as follows:

1. An EAS label, containing a magnetic strip, is attached to a product in the active state

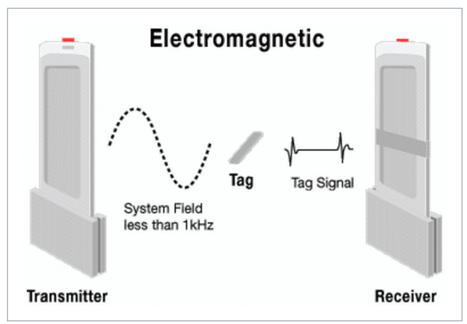
2. The transmitter antenna applies intensive low-frequency magnetic fields in the range of 70Hz – 1KHz

3. The tag increases in flux until it is saturated. Saturation occurs twice each cycle of the transmitter at each positive and negative pinnacle

4. The receiver detects changes in the amount of return signal from the tag as it moves from active to saturated

5. If the signal pattern detected by the receiver matches the pattern that is expected when an active tag passes within the field, an alarm will sound.

EM gates are typically larger than those used by most other EAS systems due to the weak response of the magnetic strip within the tag and the intensive field required for detection. Additionally, the maximum distance between pedestals is around one meter (1m). Standard operating frequency for an EM system is between 70 Hz and 1 KHz. When you magnetize the semi-hard material, it saturates the tag and puts it in its inactive saturated state. The tag can then be reactivated by demagnetizing the same material.



How Do Acousto-Magnetic EAS Systems Work?

Acousto-magnetic technology is the most recent innovation within the EAS industry. Currently, Sensormatic owns the market with their vast array of intellectual property surrounding the technology. In principle, AM technology works by utilizing a 40mm long highly magnetostrictive material with an EAS label. When subjected to a magnetic field, this material physically shrinks in size. The higher the magnetic field strength the smaller the metal becomes. The metal within the EAS tag actually shrinks about one-thousandth of an inch over its full 1.50 inch length.

Referencing the diagram below, an AM EAS system works as follows:

1. An EAS label, containing a 40mm long strip of magnetostrictive material is attached to a product in the active state

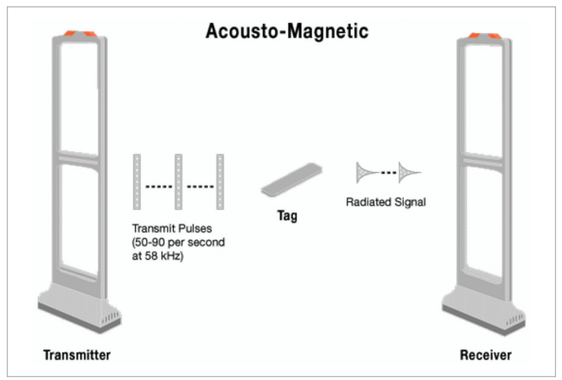
2. The transmitter antenna applies 58 KHz radio frequency waves in pulses

3. When the pulse ends, the tag responds, emitting a single frequency signal like a tuning fork due to the fact that the RF pulses have been shrinking and lengthening the magnetic material.

4. While the transmitter is off between pulses, the tag signal is detected by a receiver

5. A microcomputer checks the tag signal detected by the receiver to ensure it is at the right frequency, is time-synchronized to the transmitter, at the proper level and at the correct repetition rate. If all these criteria are met, the alarm occurs.

AM technology has the ability to protect areas in excess of five meters (5m). Acousto-magnetic systems operate using a pulsed radio frequency signal of about 58 kHz. When the AM tag is demagnetized, it is deactivated. When it's magnetized, it is activated. This is the opposite of how the deactivation of EM tags works.



EAS and Bar Code Scanners

Overview

Since the mid-90's, EAS integration into bar code scanners has been a growing trend for those scanners that target the retail POS market. In particular, nearly all scanners developed by the top five scanner manufacturers classified as presentation, mini-slot, or bi-optic have included an EAS option over the last five years. Furthermore, many suppliers are beginning to integrate EAS into hand-held scanners.

Most bar code scanners only integrate RF-based EAS deactivation, most notably Checkpoint. However, it is likely that scanners able to connect to Checkpoint deactivators can also be integrated into alternate RF EAS products such as Nedap, Cross Point, or Sidep. The reason RF is the most common EAS platform within bar code scanners is due to its simple design. All that is required is a single closed loop Eantenna system capable of carrying the RF pulse generated from the EAS deactivator. The complexity with magnetic fields associated with EM and AM technology cause many more design problems due to shielding of electronic components and space limitations within the scanner housing.

Currently, only two products offer internally integrated AM EAS deactivation. Provided by PSC and NCR those products are in the larger bioptic family of scanners and therefore have the available space to integrate the larger deactivation components. Other scanners offer an interlock integration with Sensormatic AM systems which basically use an external EAS deactivator, but supply the signal that a good bar code read has occurred and that the deactivation pad can emit its signal.

Honeywell and Integrated EAS

At present, Honeywell can only integrate with Checkpoint Systems and other RF-based EAS vendors (see EAS Suppliers at the end of the white paper).

Scanners

Product/ Model	Honeywell Cables	Deactivation Range	Switch Settings (SW 1&2 ON)
MS2xxx	A	100mm (4")	1,6
MS3780	B,D,E	75mm (3")	1,6
MS7180	B,D,E	100mm (4")	5
MS7320	A		2,3,4,5,6
MS7580	O,P	128mm (5")	All off
MS7600	A	75mm (3")	1,2,3,4,5
MS7820	Q	205mm (8")	2,3,5,6
MS9520	B,D,E C (rev D & later)	75mm (3")	
MS9540	B,D,E C (rev D & later)	75mm (3")	

Switch settings are for Checkpoint Counterpoint Systems Honeywell cable identifiers can be found in the table below. Last updated on September 15, 2009.

Electronic Article Surveillance (EAS) and Bar Code Scanning

Cables

CIdentifier	Honeywell Cable	Description	Released
A	52-52511	EAS loop Cable, 0.6m	Yes
B	55-55000C-E-3	RS232, w/Powerlink, 1.8m	Yes
C	55-55165A-E-3	USB Type A, w/Powerlink, 1.8m	Yes
D	59-59002B-E-3	KBW, w/Powerlink, 1.8m	Yes
E	59-59006A-E-3	IBM 46xx, w/Powerlink	Yes
F	55-55007C-C-3	OCIA, w/Powerlink, Compushield, 1.8m	Yes
G	59-59000C-E-3	RS232, w/Powerlink, 1.8m	Yes
H	59-59020A-E-3	KBW Stand-Alone, w/Powerlink, 1.8m	Yes
I	59-59153A-E-3	RS232 Beetle, w/Powerlink, 2.3m	Yes
J	59-59153A-N-E-3	RS232, w/o Powerlink, 1.8m	Yes
K	59-59165A-E-3	USB Type A, w/Powerlink, 1.8m	Yes
L	59-59213B-N-E-3	USB 12V PlusPower, w/o Powerlink, 3m	Yes
M	59-59235A-E-3	USB Type A, w/Powerlink, 3m	Yes
N	59-59295A-E-3	RS232, Powerlink, 2.9m	Yes
O	MX-55000-E-3	RS232, w/12V Powerlink, 2.9m	Yes
P	MX-55235-E-3	USB, w/12V Powerlink, 2.9m	Yes
Q	57-57312-3	Checkpoint, 1m	Yes
R	57-57313-3	Sensormatic, 1m	Yes

Note: All cables are straight and black in color. Last updated on September 15, 2009.

Honeywell Competitors and EAS

The following is a list of known scanners that have standard or optional EAS antennas:

Company/Model	Classification	Checkpoint	Sensormatic
Datalogic Heron	Hand-Held	✓	
Datalogic Touch65	Hand-Held	✓	
Honeywell MS3780 Fusion®	Hand-Held	✓	
Honeywell MS9520 Voyager®	Hand-Held	✓	
Honeywell MS9540 VoyagerCG®	Hand-Held	✓	
PSC QS6000 Plus	Hand-Held	✓	
Motorola LS4000	Hand-Held	✓	
Motorola LS4208	Hand-Held	✓	
Datalogic Catcher	Presentation	✓	
Datalogic Diamond DLL2020	Presentation	✓	
Intermec MaxiScan 2210	Presentation	✓	
Intermec MaxiScan 2220	Presentation	✓	
MS7180 OrbitCG®	Presentation	✓	
Honeywell MS7320 InVista®	Presentation	✓	
Honeywell MS7580 Genesis™	Presentation	✓	External
NCR RealScan92	Presentation	✓	
Datalogic Duet	Presentation	✓	
Datalogic Magellan 1000i	Presentation	✓	
Datalogic VS800	Presentation	✓	

Honeywell

Company/Model	Classification	Checkpoint	Sensormatic
ScantechID Nexus N-3030	Presentation	✓	
ScantechID Sirius S-7030	Presentation	✓	
Motorola Cyclone M2000	Presentation	✓	
Motorola LS9208	Presentation	✓	
Fujitsu 7521D	Mini-Slot	✓	
Honeywell MS7820 Solaris™	Mini-Slot	✓	External
Datalogic Magellan 2200VS	Mini-Slot	✓	
Datalogic Magellan 2300HS	Mini-Slot	✓	
ScantechID Castor C-5010	Mini-Slot	✓	
ScantechID Pollux P-4010	Mini-Slot	✓	
Motorola LS5700	Mini-Slot	✓	
Motorola LS5800	Mini-Slot	✓	
Motorola LS7708	Mini-Slot	✓	
Zebex Z-6080	Mini-Slot	✓	
Zebex Z-6081	Mini-Slot	✓	
Zebex Z-6082	Mini-Slot	✓	
MS2400 Stratos®	Bi-Optic	✓	External
Honeywell StratosE®	Bi-Optic	✓	External
Honeywell StratosH®	Bi-Optic	✓	External
NCR RealScan 7872	Bi-Optic	✓	External
NCR RealScan 7875	Bi-Optic	✓	External
NCR RealScan 7876	Bi-Optic	✓	✓
Datalogic Magellan 8100Ω	Bi-Optic	✓	External
Datalogic Magellan 8200Ω	Bi-Optic	✓	External
Datalogic Magellan 9500Ω	Bi-Optic	✓	✓
Datalogic Magellan 8500Ω	Bi-Optic	✓	External
ScantechID Gemini G-5040	Bi-Optic	✓	

List last updated on September 15, 2009

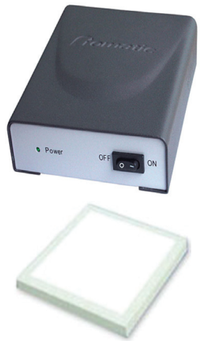
EAS Terminology

Detection/Deactivation

Gate/Pedestal

An element of an EAS system, usually placed in exits or checkout lanes, which detects and alarms when live labels pass through the field developed by it. A system typically incorporates a pair of gates/pedestals. One gate is used as the transmitter to generate the field at a given frequency, while the second gate is used to receive the resultant signal. The presence of an active EAS tag will cause the resultant signal to match specific signal patterns that enable the system to sound in detection of a tag.

Deactivators



Desirable qualities in deactivators include a large deactivation zone and 100 percent deactivation with no false alarms. The type of electronic deactivator depends upon the kind of EAS system and tags used by the store. Standard deactivation devices include a pad or bar code scanner with an integrated EAS antenna.

Detachers

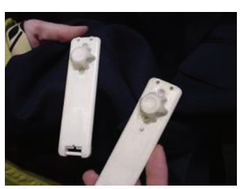
To remove most hard tags, a detacher/releaser is necessary. Today's detachers, which basically unlock the tags, are designed so that they cannot be copied or purchased by shoplifters. Some detachers are hand-held; others are fixed—most are simple devices with no moving parts, something that makes them very durable.

Labels/Tags

Disposable tags

Disposable paper tags and labels are available in many different types—pressure-sensitive labels with simulated bar codes, tags or labels that can be imprinted with price, inventory, promotional or bar-code information, and tags specially designed for products such as earrings, compact discs and cosmetics, which are all items easily pocketed by shoplifters. These thin, adhesive-backed labels can be as small as a paper clip and can be easily disguised to look like standard retail tags. Most importantly, the radio frequency tags, unlike tags connected to some electromagnetic sensors, can't be disrupted by common magnets.

Reusable tags



Probably the most familiar reusable tag is the hard, plastic tag attached to most apparel and armed with an almost impossible to defeat locking mechanism. This off-white, pin-connected tag requires a special detacher unit to remove it. Other reusable tags you might have seen include plastic devices without pins (they use a foam rubber pad! and abrasive strip to grip garment firmly without causing damage), lightweight colored tags encased in clear plastic, flexible tags printed with a simulated bar code, and fluid tags.

Honeywell

Benefit denial tags

This is a fluid tag. If you steal an item with this kind of tag, you're going to get an unpleasant surprise when you try to remove it in the dressing room or later at home. The ingenious tags have been designed to break and release fluid—usually colored indelible inks—onto the garment (working even against gravity) and on you if you try to forcibly remove it. The idea is that a shoplifter is being denied any benefit from his/her crime and will not be able to use or sell the item because it has now been ruined.

Source tagging

As its name implies, source tagging is the embedding of security labels at either the point of manufacture or packaging. Source tagging has been highly successful in the packaged products industry and retailers are starting to use it for merchandise such as earrings, apparel, shoes, batteries, computer software, sporting goods and electronics. Retailers' interest in source tagging has increased as shoplifters have gotten around anti-shoplifting tags applied to the outside of packages by removing the product and leaving the empty box on the shelf. Furthermore, source tagging shifts the labor cost associated with tagging products from the retailer to the manufacturer or distribution facility.

The newest source tags are paper-thin and easily integrated into automated production processes. These tags are applied in primary packaging or within/on the product itself. For example, EAS tags are now being incorporated into woven garment tags and tags for CD's are being placed within the CD itself. Source tags can be invisibly embedded between layers of thin paper stock or cardboard on standard blister packages. These invisible tags, which are deactivated by the clerk, are especially effective at addressing employee theft. However, with the use of invisible source tagging, many retailers and organizations feel that the value of deterring theft is lost as potential shoplifters can no longer see the protecting label.

Interlock

The communication between bar code scanner and EAS deactivator that requires the detection of a good bar code read before the signal is sent from the deactivator to disable the EAS tag. EAS interlock prevents customers from passing a protected product through the deactivation field of a scanner (without scanning the product) and disarming the tag. This action would enable customers to freely deactivate products without performing the proper checkout process. All that is required for this feature is another connection point from the scanner to the deactivator that signals when a good read occurs.

EAS Suppliers

Supplier	Headquarters	AM	RF	EM
Sensormatic	USA	✓		
Checkpoint	USA		✓	✓
Nedap	Netherlands		✓	
Sentech EAS	USA		✓	
Shenzhen Promatic Security Systems	China		✓	
Cross Point	Netherlands		✓	
Dialoc ID International	Netherlands		✓	✓
Gateway Security	Sweden	✓	✓	✓
Sidep	France		✓	
TAG Company	USA	✓	✓	